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MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE.

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

AUGUST, 1834.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

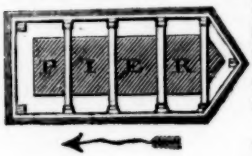
Description of the Viaduct near Peters' Island. *By* JOHN C. TRAUTWINE, *Architect and Engineer, Philadelphia.*

THE SITE.

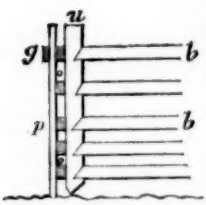
This extensive structure, upon which the Columbia and Philadelphia rail-road crosses the river Schuylkill, is situated three miles above the latter city, at the property of the late Judge Peters, on the western, and that of Isaac C. Jones, Esq. on the eastern side. At the site of the bridge, and for some distance above it, the stream preserves an average width of 850 feet, but widens considerably immediately below it. The western shore rises very gradually from the water's edge for about 150 yards, until it arrives at the foot of the high elevation which forms that slope of the river valley, and which the rail-road overcomes by means of an inclined plane, and a stationary engine of sixty horse power. On that side, the depth of water under the bridge is only four or five feet, but it increases gradually to within twenty yards of the opposite shore, where it is twenty-two feet. From this latter point the bottom rises very abruptly into the high and precipitous rocky bluff of the eastern slope of the valley. The bed of the river is a soft black mud, overlaying the solid rock to a depth of from four to ten feet.

COFFER-DAMS AND MASONRY.

The bridge consists of seven arches, six piers, and two abutments. Five of the arches span 138 feet each; and the remaining two 125 feet each, making with the piers, which are thirteen feet broad on top, a total of one thousand and eighteen feet in the clear between the abutments. All the masonry is founded on the solid rock, with the exception of the western abutment and the western pier, both of which stand on dry land, and rest on a firm natural gravel. The founding of the water piers, and of the eastern abutment, whose face extends a little distance into the stream, was effected by means of coffer-dams, of a very simple construction, suited to their situation in *slack water.* They were framed one at a time on Peters' Island, (which is a small spot in the middle of the river, about one-eighth of a mile above the bridge,) and after being launched, and towed to their proper position, were well moored, and finally sunk by placing large stones on a temporary platform made for the purpose. The strains caused by the uneven bearings on the rock were in no case sufficient either to rupture the frames, or even to throw them so far out of line as to create much difficulty in driving the piles. Their entire length, including an up-stream salient angle, was about eighty feet; their breadth thirty-four feet.



They were composed of a single row of uprights *u*, one being placed at each of the five angles, and others at intervals of fifteen feet, along both sides, but none at the ends.



Transverse beams, *b*, about thirty feet long, extending from side to side, were notched into the uprights, and secured to them by iron dogs.

In order to resist the increased pressure of the water towards the bottom, the vertical distances between these beams decreased gradually from three feet near the surface, to eighteen inches at the rock; they were removed as the piers were built up, and their places supplied by short struts abutting against the masonry.

Outside of the uprights, and in number corresponding to the transverse timbers, were spiked rows of horizontal beams, *o o*, &c., surrounding the whole dam: over these, the sheeting piles, *p*, of three inch pine and hemlock plank, were driven, until their feet rested on the rock, and their heads remained about eighteen inches above high water mark. This operation was performed with perfect ease, the softness of the mud rendering necessary no other instrument than a heavy wooden mallet worked by two men.

The pile-planks were properly directed in their descent by a horizontal leading beam, *g*, at the top of the frame, and were kept close together at their feet by the usual method of sloping one end, thus—

With these precautions they drove kindly, and but little trouble was afterwards experienced from leakage. Gravel was thrown in around the dam, and permitted to form its natural slope, until it reached to within one or two feet of the surface of the water.

Slight as the construction of these dams appeared, the result proved that they were all sufficiently strong for the purpose, except that of the eastern pier, which, being unable to resist the pressure of a twenty-two feet head, (or if we include the semi-fluid mud, one of a twenty-eight feet,) failed in consequence, and was afterwards repaired with additional precautions.

As each coffer-dam was sunk, the water was taken out by six or eight common pumps, worked by a steam engine of six horse power, floated on a scow; and the rock, after being cleared of the mud (which was raised in buckets, partly by windlass, and partly by handing it up successive stages,) was properly levelled and stepped off for receiving the foundations of the piers.

The piers at high water mark are sixty feet long, exclusive of the triangular pier-heads, or starlings, and batter both below and above water at three-fourths of an inch to a foot, as high as the skew-back, from which spring the curved ribs of the superstructure. From the skew-back they rise vertically to the level of the chord pieces C, which rest on them. Their height above water is thirty-five feet, and their breadth at high water twenty feet. The abutments are thirteen feet thick at their base, and batter externally three-fourths of an inch to a foot, that their faces may accord with those of the piers; internally they are vertical. The western wings form circular segments to a radius of fifty feet, their chord being seventy-nine feet. They are nine feet thick at the face of the abutments, and six feet at their extremities; they finish off by two flights of steps twenty-four feet high; like the abutments they batter three-fourths of an inch to a foot outside, and are vertical inside; they are surmounted by a coped parapet wall two feet thick. The exterior masonry of both piers and abutments is a very neat hammer-dressed rangework, forming a system of alternate headers and stretchers, of which no course is less than twelve inches in thickness, nor any header less than three feet in length. The back-joints, both vertical and horizontal, are at least six inches in width, and are neatly pointed above high water, below which they are laid in Roman cement, extending eight inches back from the face. The material employed is a handsome, compact, gray, gneiss rock, from the extensive quarries at the Falls of Schuylkill, distant two miles above the bridge.

The interior is of rough rubble, varying in size from eight or ten cubic feet, down to a few inches; laid in full mortar, and the interstices completely filled with liquid grout, which was run in as the work was raised, at every twelve or eighteen inches. The filling in is principally from quarries of a very compact black gneiss, opened for the purpose on the eastern edge of the river, at the immediate site of the bridge.

No cramps or chains are inserted into any part of the masonry, it being considered that the large dimensions of the face stones, and the accuracy of their joints, rendered such precautions entirely superfluous. For handling the stones a long pole was planted in each pier near its foundation, and supported a sliding crane, which was moved upwards as the masonry proceeded, and finally was lifted over the top of the pole when the pier was completed, the pole itself being left enclosed in the stone work. The expense of removing the coffer-dams being considered greater than the value of the materials composing them, they were permitted to remain round the piers. The total amount of masonry in the bridge is 19200 perches.

THE SUPERSTRUCTURE.

The putting up of the timber work, which had been already prepared on the ground, was commenced at the western end of the bridge; the abutment and piers on that side having been finished some time in advance of the others. For this purpose a temporary scaffold was erected, to support the wooden superstructure; it consisted merely of slight trestles, varying from twenty-five to sixty feet in height; they were composed principally of ten by twelve timbers, strengthened by a very few transverse longitudinal braces, and placed twenty feet apart. Their legs were sunk into the mud of the river until their feet touched the rock. Notwithstanding the apparent lightness and insecurity of this scaffold, it not only sufficed to sustain the weight of the platform, but also resisted, effectually, the force of several considerable freshets, nor did any accident occur upon it from want of strength.

On the upper or transverse beams of these trestles were laid longitudinal timbers, extending from one to another, throughout the entire length of the scaffold; they supported the adjusting or raising blocks, which were merely short rough pieces of timber placed transversely on top of each other to rectify any inequalities arising from the uneven bearings of the feet of the trestles.

Resting on the blocks, and also on the piers, were laid the chord pieces C, to which were applied and attached, in order, the queen posts Q, poles P, braces R, and the curved ribs T T; after which the scaffold was removed. The settlement consequent on this latter operation, did not amount to half an inch in any arch.

The straining beams V and the straining sills U, together with other secondary timbers, were not introduced until after the removal of the scaffold.

The bridge was originally intended for the accommodation of the rail-road traffic alone; but in anticipation of a proposed turnpike to cross at the same place, it received an additional breadth sufficient for the purposes of both, at the same time admitting of a foot passage four feet in width between the two. The entire breadth, from out to out of the queen posts, is now forty-nine feet eight inches.

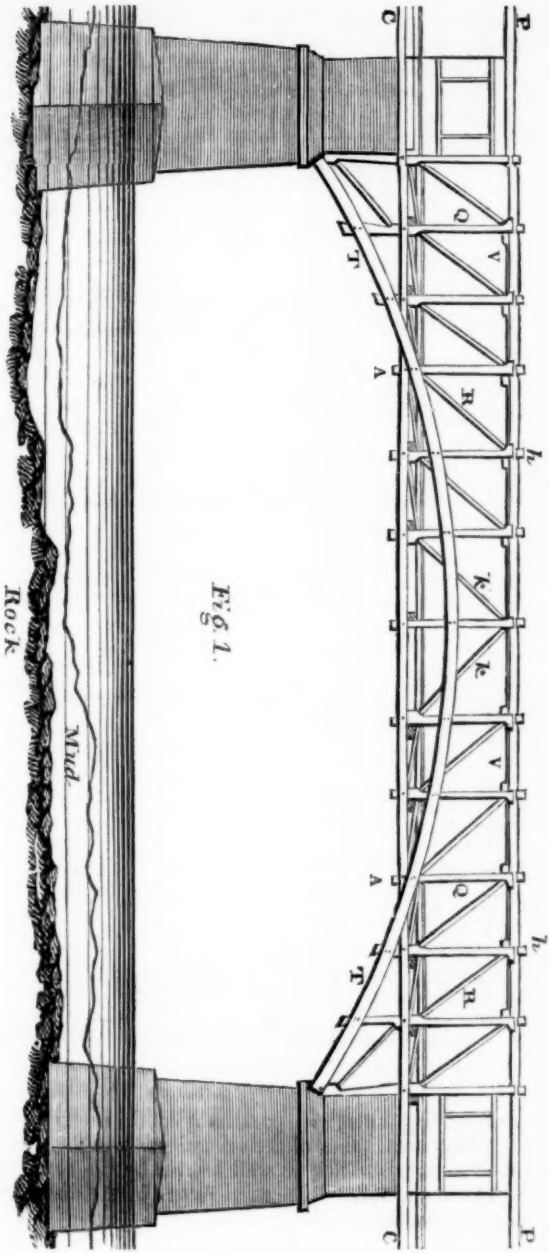


Fig. 1.

Fig. 2.

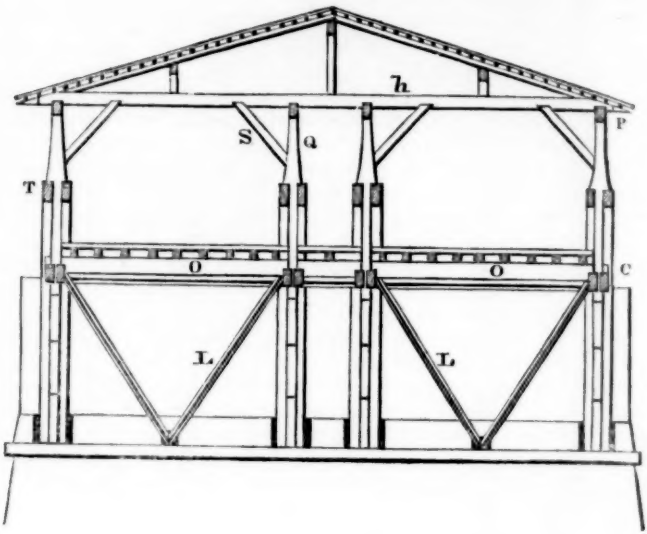
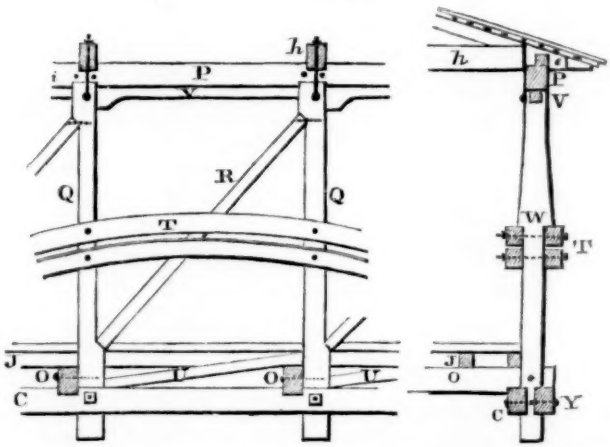


Fig. 3.



The accompanying cuts will greatly assist in understanding the following detailed description of the several parts of the truss; which is of the excellent combination so well known by the name of its patentee Mr. Theodore Burr. The same *letters* in the different figures refer to the same *parts*.

I have never seen Mr. Burr's specification, but have been informed that he attaches his claim of originality only to the carrying of the curved ribs *up into* the truss, and *there* confining them to the king and queen posts; instead of the long practiced method of placing the ribs *below* the other parts of the truss, and attaching them to the *feet* of the queen posts. I apprehend, however, that this is not the case, from the circumstance that both these particulars appear to be united in the bridge built by Grubenman over the Limmat, in Switzerland, as far back as 70 years ago. Be this as it may, however, the departure from the old truss has considerable advantages in particular cases; more especially where it is necessary to keep the roadway as low as possible, and at the same time to elevate all the timbers beyond the reach of floods. It is attended also by a small saving of timber.

But these advantages are unfortunately so far outweighed by the contour of the exterior, that it is but seldom admissible in cases where a *chaste architectural* effect is required. In the present instance no such requisition existed, and the covering was consequently made perfectly plain.

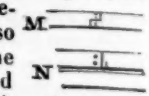
There is probably no wooden bridge in existence, (certainly none of which I have seen the representation,) that can vie in point of beauty with that erected thirty-two years ago by Timothy Palmer, over the Schuylkill, at Market street, Philadelphia,—a circumstance which reflects but little credit on the growing taste of either the builders themselves, or the companies at whose expense the bridges are constructed. So correct an exterior as *it* exhibits, can never be produced in a large bridge whose floor is placed on the *chord*, instead of the *tangent* of its supporting ribs.

One of the best features of the bridge at Peters' Island is the just proportion of its individual timbers. With the exception of the floor girders and joists, which are too small, they are generally well adapted to the spans, and would serve as standards for designing those of other dimensions.

So little attention has usually been paid to this particular that in some bridges of even 200 feet span and upwards, the timbers have not equalled in size those of the bridge now in question; on which account several have failed, and thereby rather tended to bring this particular arrangement into unmerited disrepute.

Fig. 1, exhibits a side elevation of one of the 125 feet arches, exclusive of the roof; and fig. 2 a transverse section of the same, taken at the centre of the arch, but including the roof; the former carefully drawn to a scale of twenty-four feet, and the latter of sixteen feet to an inch. The details are represented on a scale of one-eighth of an inch to a foot. The ribs are cut to the proper curve out of the solid timber, in lengths of twenty-two feet, and are in two separate parts, each eight inches broad by eighteen inches deep at the crown, and twenty-four inches at the springing. These two parts are placed ten inches asunder, so as to permit the king and queen posts, and braces, to pass between them, (see T fig. 3.) In depth, the ribs are composed of two beams, placed about one inch apart (to permit a circulation of air,) with blocks of wood inserted at every few feet to keep them separate. At the spring-

ing they abut on cast iron plates, one and one-fourth inch thick. The scarfs of the pieces composing the ribs are shown in plan by M, and in side view by N; the half laps are united by two tree-nails. Their length is six inches, and they are so placed as to break joint at every eleven feet. The king, and such queen posts as intersect the curved ribs *above the floor*, are so much wider above than below them, as to allow of two shoulders, each two and a half inches broad, by which to rest on them; (see W) and, as well as all the other queens, are still further connected to them by wrought iron bolts one inch in diameter. This is a much better plan than the usual one of *bolting only*.



The chords C are, (like the ribs,) in two pieces, each eight inches broad by fourteen inches deep, placed one and a half inch apart. Between them pass the queens and kings, which are halved to them at the intersections, and strongly bolted, (see Y.)

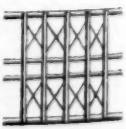
The queens are nine by ten inches, except where they rest upon the curved ribs, at which point they are increased by the shoulders to nine by fifteen. Their heads notch into the pole, to which they are further secured by mortise and tenon, through which are driven two tree-nails an inch in diameter, (see *i*.)

Between the heads of the queens, and bolted to the under side of the poles, are the straining beams V V, six by six square at their smaller ends, and six by ten at their butts. At the feet of the queens are inclined straining sills, of plank five inches thick, by ten wide. One end rests on the floor girders, and the other on the chords, (see U.)

The queen braces R, R, &c. are five inches deep by ten wide; the king braces *k*, *k*, are of the same width, but nine inches in depth. The heads and feet of both are mortised and tenoned, and spiked to the joggles of the king and queen posts. The pole P is ten by twelve. A transverse floor girder, O, nine inches wide, by fifteen deep, is placed behind each queen, to which it is bolted. Every third one of these girders is in a single piece extending entirely across the bridge. They all notch upon the chords, and support floor joists J, five inches wide by seven deep, placed two feet apart from centre to centre. On these joists are spiked, transversely of the bridge, the three inch planks, which, on the track appropriated to common travelling, form the floor of the roadway; but which on the rail-way track, support longitudinal strings of six by six, to which the iron rail bars are spiked. Between these strings is an additional thickness of plank for the horse-path.

Over each queen post, and notched upon the pole, is a transverse roof girder, six inches wide by twelve deep, confined by long bolts to the heads of the queens. (See *h*.)

Horizontal diagonal braces, seven inches by seven, disposed as shown in the figure, are tenoned in between every two consecutive girders, both in the roof and under the floor. They merely touch each other at their points of crossing, and are provided at their ends with wooden keys for forcing their tenons home into the mortises.



L, L, in the transverse section, represent braces extending from

the skew-backs of the piers and abutments, to the point of intersection of the chords with the third queen posts, (A, A, fig. 1.)

At this point also, a wrought iron tie-bar, two inches in diameter, extends across the entire width of the bridge, and is confined by burrs at the outside of the chords.

The side braces, S, are of oak, four by five inches, mortised, tenoned, and spiked, to the queens, and to the roof girders. With the exception of these, and the shingles, all the timber of the superstructure, (amounting to one million and eight hundred thousand feet, board measure,) is of white pine, from the shores of the Susquehanna. All of it that shows above the floor is planed; all below is rough; none of it is finished with that degree of nicety which would have been necessary had the bridge been in the immediate vicinity of the city. One hundred and sixty thousand shingles, of Carolina cedar, laid in nine inch courses, were required to cover the roof.

The total weight of iron worked into the timber is, cast, six tons; wrought, ten tons; the former consisting of the abutting plates for the ribs and braces L L, and of the burrs and washers for the screw bolts; the latter of screw bolts and spikes, and the tie-bars under the floor, at intersections of braces L, L, with the chord pieces.

The time that elapsed between the delivery of the rough timber at the site of the bridge, and the passing over of the first cars, was only three months, but at that time, neither the roof, flooring for common travelling, nor weather-boarding were commenced. The studs for the weather-boarding are three inches by four, and are placed vertically, two feet apart, from centre to centre. At their lower ends they are notched two and a half inches upon the chords; higher up they notch slightly on the ribs, and at their upper ends tenon into the projecting feet of the small rafters of the roof, which, for that purpose, are also placed two feet apart. The small rafters foot upon the longitudinal piece *e*, four inches by four, spiked on the upper side of the pole P. The projection of the eaves extends two feet six inches beyond the outer line of the queen posts. The weather-boarding is in horizontal courses of three-fourths inch plank, planed on both sides; not tongued and grooved into each other, but merely laid overlapping. No part of the studs, or weather-boarding, is shown in the drawing. The bridge is lighted by large Venetian windows at the sides, two over each pier; and by two skylights over the centre of each span. The superstructure was executed by Jno. P. Babb, of Wilkesbarre, Pennsylvania, by a sub-contract, under the principals, Dodd, Bishop, and Brittain, who directed their attention more particularly to the masonry. The general superintendence of the work on the part of the state was entrusted to Mr. Frederick Erdman, a gentleman whose extensive practice, and uniform success, in important mechanical undertakings, had rendered him particularly eligible to that duty.

The contract prices were, for masonry $4 37½ cts. per perch of twenty-five cubic feet; and for superstructure $30 per lineal foot of bridge platform. These prices include all materials, coffer-dams and workmanship of every description, no allowance whatever being made

for extras, except for such additional work, not specified in the contract, as might be particularly ordered by the principal engineer.

CONCLUDING REMARKS.

The reader will probably consider that I have occupied him too long by a minute recital of details; but as I am not aware of the publication of any paper descriptive of Burr's bridges, and believe that the deficiencies of many that have been erected might be ascribed principally to that cause, I confidently crave the indulgence of those who have found me tedious, reminding them that my object has been, not so much to present an account of this individual structure, as to furnish useful data to those who, when building for themselves, will not consider the most trifling fact as unimportant. Burr's plan for wooden bridges is perhaps the best now in use; and that at Peters' Island being probably the most correctly proportioned of any yet constructed on that principle, was better calculated than any other for the purposes I had in view.

I should, however, act at variance with my declared motives for writing these pages, were I not to exhibit the defects as well as the excellencies of this important work. They, fortunately, are very few, and will detract in no sensible degree, from the general character for utility so justly ascribed to it.

The insufficiency of the floor girders and joists has been already adverted to. The clear bearing of the former from chord to chord is nineteen feet ten inches, and their distance apart varies from nine to twelve feet; any one of them may, in the case of two heavily laden cars passing each other, be obliged to sustain a weight of from six to eight tons, which is certainly too much to be placed on a girder of nine inches by fifteen, and of twenty feet bearing, if the beam is required not to bend somewhat under it. This may easily be remedied by either placing the girders nearer each other, without reference to the queen posts, and permitting the joists to remain as they are; or by retaining the present intervals, and employing larger timbers for both girders and joists. It would be difficult to procure single pieces sufficiently deep for that purpose, but they might readily be constructed of two beams in depth, firmly connected together. The same defect exists in the before mentioned bridge at Market street. The clear bearings of the girders are there eighteen feet; their distance apart, the same; and their dimensions fourteen inches broad by seventeen deep; it was, after some time, found necessary to adopt precautions for strengthening them. Again, the height of the bottom of the roof girders above the rails is but twelve feet; it would have been more agreeable to outside passengers, on high cars, if it had been thirteen or fourteen feet.

The crossing of the stream obliquely, is, when considered in the abstract, a fault of considerable importance; but in this case it was rendered necessary by overruling circumstances, which it would be foreign from the subject to dilate upon at present.

The foot path should have been at least six feet wide.

Lastly, the starlings, or pier heads, to be perfectly effective, should

have been carried considerably higher above the surface of the water. Their use is principally tested in times of ice floods, by dividing the ice, and forcing it to glance off from the angles of the piers. But, as they now are, a broad pier face is opposed to the current, whenever the water rises rather higher than usual; and by obstructing the passage of the ice, is calculated to heap it up, and, thereby damming the stream, to endanger the safety of the whole bridge. Fortunately, however, there is but little probability of such an occurrence taking place, for the increased width of the stream at, and below, the site, allows the ice, (which is in some measure broken up by the island,) to expand itself over a larger surface than it occupied above the bridge, and thus diminish both its velocity and its consequent power to do injury. J. C. T.

Steam Navigation.

The elements of accurate history are, upon all subjects, perpetually and rapidly passing away, and the historian, in general, is compelled to resort to conjecture, in order to fill up what would otherwise be the void spaces of his charts. To obtain an accurate knowledge of the particular circumstances which give rise to, and are attendant upon, important events which occur in our own time and neighbourhood, is always difficult, and sometimes impossible. We, confessedly, owe much to the journals of the day, for materials which we could not otherwise procure, but, it need not be said that numerous causes operate to forbid an implicit reliance upon their statements, in any one particular, however talented, industrious, and honest, their conductors may be. These observations, which apply with greater or less force to every subject, do so, in an especial manner, to that of mechanical inventions and improvements. Projectors are in general ardent, and sanguine, but numerous failures mark the path of almost every one, even of those who are eventually the most successful; and however instructive the history of these failures might be, they are rarely objects which the inventor wishes, or is even willing, to place before the public, a tribunal more apt to judge of merit by success, than by any other standard; yet it not unfrequently happens that the most meritorious navigator has his barque stranded, and converted into a beacon by which others are directed into the proper channel.

Every one who has paid attention to the subject is aware of the extreme difficulty of assigning to individuals their relative proportion of honour, after an important invention has become a public benefit. Many unknown names are thereby brought to light, as candidates for the wreath of fame, all claiming to have accomplished the object, although the prize has been awarded to another. We know not of any one discovery which would serve more aptly as an exemplification of these remarks, than that of navigation by steam. We, however, are not about to enter the lists, and become disputants upon this point, as we have no new

materials to furnish, and are of opinion that most of the facts relating to it, which are now obtainable, have been put on record. Our only object in making these remarks was to provide a preface for the historical sketch of the origin and progress of steam navigation, in the Port of London, written by a gentleman now residing in this country, who was an active participator in the undertakings of which he has offered a brief detail. The essay now published will be succeeded by others, in future numbers of this journal, and will, we believe, bring to light, and save from oblivion, a number of important details, several of which were publicly known at the time of their occurrence, but are now recollected only as isolated facts. To Americans, this subject is one of particular interest, and one with regard to which they may well feel an honest pride in having correct details every where made, as detraction from the merit of others is not necessary to their own praise.—*Editor.*

A Sketch of the origin, progress, and improvements, of Steam Navigation, in the Port of London, from 1814 *to* 1824.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

New York, June, 1834.

Sir,—So many, and such very serious, accidents, have happened among steam vessels in the United States, that it appears high time that some legislative enactment should be adopted to protect the public from their dreadful consequences: but the difficulty is in replying to the question, what fetters ought that legislative enactment to impose on a science yet in its infancy? A correct history of its progress, and present state, will be important in aiding any attempt to solve this inquiry.

The writer, having been connected with much of the early steam vessel business, in the port of London, and having had the opportunity to obtain much information from other individuals, it may be acceptable to many of your readers, to have an abstract of the march of improvement in that port, in regard to this interesting and important subject.

About August, 1814, the first serviceable steam vessel made her appearance in the Thames; she arrived from Scotland, under the name of the Margery, and in the shape of a decked boat, about sixty-five feet long, by twelve feet beam, having a common Boulton & Watt wagon-shaped boiler, and an engine with a cylinder of probably about fourteen inches diameter, and three feet stroke, with a common bell crank connexion to the wheel shaft; the size of her wheels is not remembered. Her machinery was very imperfectly made, and constantly wanting repair; in fact, she had been driven away from a station on the Frith of Forth, by better vessels; and was brought to London, in the hope of selling her to the owners of the sailing passage vessels, between that city and Gravesend, a distance of about twenty-eight miles by the river; and, as they would not hear of such a purchase, the owners of

the Margery commenced an active opposition to them. The proprietors of these vessels were all sail-makers, mast-makers, rope-makers, ship chandlers and builders, except the managing owners, who, under the charter of the "Waterman's Company of London," were necessarily all members of that body, as also were the hands employed on board; and all feared that this new power would, as it ultimately did, drive their sailing vessels out of the trade. There were then nearly thirty of these vessels, of from twenty-five to forty tons burthen, built and fitted in such a manner that each cost from $3000 to $5000. The owners could not then be convinced, that the only way to meet this new enemy was, by opposing him with a superior steam vessel; and after trying all the modes that ignorance and prejudice could devise, some of which were ludicrous and stupid enough, they at length ascertained sufficiently the opinion of an old local magistrate, to bring the matter before him, upon their charter; and he ruled, that by that document, no one but a "*Free waterman*" could navigate the Thames for hire; and inflicted penalties for infraction, which the owners of the Margery were now become at once too poor to pay, or to appeal against in a higher court, and they compromised by withdrawing the vessel, thus leaving the good citizens of London, for twelve years more, at the mercy of the triumphant fraternity of "*Free watermen*," with their uncertain sailing vessels, or to the more costly care of the stage owners and coachmen on the road. About the year 1826, some other parties had the good sense to bring the whole matter before the King's Bench Court, where Lord Tenterden ruled, that the charter granted in the reign of Queen Anne, could not, by any means, be held to control, impede, or direct, the mode of using an invention, not made for a century afterwards. By this decision, he broke up the monopoly of the "*Free watermen*," and the public have since had the benefit of the speed, and low rates, occasioned by the competition among the steam packet owners, and between them and the stage owners, most of whom have now left the field to their competitors. The Margery was, in 1815, sold to the French government, under Louis XVIII. and in that employ we shall have to notice her again, in the course of our narrative.

The year 1815 exhibited three steam vessels upon the Thames, one called the Thames, and one the Regent. The first arrived from the Clyde, in Scotland, having left there for the same reason that drove the Margery to seek her fortune farther south. She was bought, on the account of some persons in London, by a young engineer named Dodd, the son of the original projector of the Waterloo bridge. This vessel was about seventy feet by fourteen, and drew about four feet water, had a single vertical cylinder twenty-four inches diameter and about three feet six inches stroke, working by a bell crank connexion with a fly wheel to the wheel shaft, and having a common wagon shaped boiler. Under Dodd's care, she made the passage, in the first of the summer, by the St. George's and British channels, round the south coast to London,

to the affright of many a poor coaster and fisherman, who, never having even heard of such a vessel, imagined that the real "*flying Dutchman*" was in pursuit of him. Her arrival in London, in June, 1815, caused a great sensation; as she had encountered bad weather, and had demonstrated the practicability of steam vessels making a sea passage. She immediately commenced running between London and Margate, about eighty miles east of London, of which forty miles are sea navigation, by intricate channels among dangerous sands; and, performing the passage in the average time of twelve hours, she excited so much curiosity among the citizens of London, of all degrees, that she this year made a golden harvest for her owners, and enabled Dodd to persuade them into building a second, and somewhat similar, but larger and stronger, vessel, to be called the Majestic, to run in concert with the Thames, the following year. The sailing vessels, running between London and Margate, did all they could against this new antagonist, but to no purpose.

The Regent was built in the Thames, for a gentleman of considerable property, and high character, named Hall, who had long entertained an idea that steam would soon supersede sails. He had the misfortune to fall into the hands of an ignorant pretender to science, named John Reedhead, a native of Northumberland, who had once been a coal fitter at Newcastle, but was subsequently engaged in a few voyages in the coal trade, and, for some short time was in the employ of Mr. Whinfield, an engineer in Newcastle, who was the first that mounted a steam engine upon wheels, to drag coal wagons upon a rail-road, from the coal pits to the vessels.

This Reedhead was unable to write so as to be understood, and altogether ignorant of mathematics, and of the laws which govern the motion and power of fluids; but, he had performed some accidental service for Mr. Hall, and had gained his confidence so far that he obtained the superintendence of the intended new steamer. She was about eighty feet long, by eighteen feet wide, and he persuaded Mr. Hall to build her with two trunks, entering the bows, one each side the stem, and passing by the side of the keelson, to an open scuttle in the bottom, near the run abaft, which scuttle was surrounded by a water-tight tank, in which was placed a paddle wheel, similar to those now used; this wheel, being moved by an engine with a cylinder of about twenty-four inches diameter, and four feet stroke, with an overhead walking beam, was to propel the boat, by drawing in the water from the bow, and sending it against the aftermost side of the scuttle-tank, and thence, *downwards*, through the scuttle. The engine was worked by steam, generated in a wagon-shaped boiler, having a fire flue in it, going direct into the chimney, at the opposite end to the fire doors. But lo! on trying the engine, it was found the wheel was so deep in the water, that the crank could not be got over the centres, without the aid of a fly wheel; when this was applied, motion was obtained, but at so slow a rate, as to be useless, except to demonstrate the fact, that whatever motion the vessel had, *was stern foremost.* In this dilemma, no alternative remained, but to do away

the tank, fill up the scuttles, and lengthen the wheel-shaft, to receive wheels on the outside of the vessel; when this was done, Reedhead boasted, that the Regent would run ten miles an hour, though while in his care she never reached four. The month of August had now arrived, and with it came the third steam vessel, named the Defiance, built at Norwich, about 112 miles from London, by two scientific young engineers, under the firm of Aggs & Curr. She was seventy-three feet, by twelve, drew about three feet water, was clinch built, and an excellent model for speed, in smooth water, or river way; had two ten inch horizontal cylinders, with three feet stroke, working into rectangular crank pins, on pinion wheels, gearing into large drift wheels on the paddle shaft; the paddle wheels were large in proportion, and the engines were worked by cylinder boilers, the whole of workmanship superior to any thing that had then appeared afloat. This vessel, also, was put into the Margate trade, and had she been somewhat larger, and better fitted for the sea, she would have given the Thames some trouble; no one however would go in so low a vessel, when the lofty Thames was near, and besides this, the character the Thames had acquired was an additional aid to her.

The Regent was put into the trade to Margate, to compete with these two vessels; but a few weeks showed Reedhead's incapacity in so strong a light, that the proprietor turned her over to the care of another superintendent, one who was well acquainted with practical ship-building, and who had a correct theoretical knowledge, and some experience with the steam engine. A few days enabled this person to show the proprietor, that the wheels and engine were grossly disproportionate, the engine ill proportioned in all its parts, and the boiler unequal to a supply of steam, even with a fire so intense as to put the vessel in jeopardy, by heating the chimney *red hot*, several feet above the deck; but, as the hull of the vessel was of a good model for speed, and of quite sufficient strength, it was determined to refit her in a proper way, during the winter. On a settlement of the account of expenditures, it was found that by gross mismanagement, this small vessel had cost £8000 sterling, or nearly $36,000.

During this year, Mr. Maudslay had built a small engine, *to order*, to propel a passage and baggage vessel, between Ipswich and Harwich, which was entirely unsuccessful, owing to the ignorance of the managers, and not from any fault on the part of the mechanician.

When it was time to commence refitting the Regent, the owner was induced by Mr. M. J. Brunel, to place her in Mr. Maudslay's hands; and the result showed, that the experience of the previous summer had not been gained in vain.

In the winter of 1815–16, Dodd had followed up the building of the Majestic, on nearly the same plan with the Thames, but about eighty-five feet long on deck, with a thirty inch cylinder and three feet stroke, plain slide valve, and a common bell crank connexion; but on getting all fitted, it was found that the hull, engine, and boiler, were all so unnecessarily heavy, that the vessel drew a foot more water than she was set down for; from this, and delays in her equipments, she was not ready so soon as the Regent. The Defiance had

been sold to go to Holland, in fulfilment of a patent, granted to some Englishmen, to navigate the rivers of that country by steam; and she, during the year 1816, astonished the natives of that country, by her performances; but when, at the end of the year, an increase of accommodations became evidently requisite, a disagreement had arisen between the patentees, and on the vessel coming to England for repairs, she was suffered to lie and decay for several years, and the patent was eventually forfeited by non-user.

In June, 1816, the Regent came out, with two twenty-two inch cylinders, and thirty-two inch stroke, and four way cock valves; the engine working by a bell crank motion, through a pair of rectangular cranks, upon a pair of wheels ten feet diameter, and five feet paddle boards, dipping twenty inches in the water, and making twenty-eight revolutions per minute. The steam was generated in a square boiler, with returning flues, and the fire places all within the water. Every part was made with the most careful calculation, to have no more weight, than was needful to attain a moderate amount of surplus strength. With the boiler filled, and coals on board, the vessel drew, keel included, four feet four inches water; and previous calculation led to a belief, that she would reach about seven miles per hour, nearly the same as the Thames; but, on the first trial, it was evident she would run eight miles per hour, and could be depended on to maintain it, even against a strong wind. She now took her place, in opposition to the Thames, and always gave her an hour's start and frequently beat her another hour, in the time of arrival.

During the summer, another Scotch vessel, called the Caledonia, was brought round, and tried against the Regent; although much boasted of before commencing, she proved to be altogether worthless, and was speedily withdrawn. We shall have to notice her again, by and by. The Regent made out a successful summer, against the Thames; and nearly at the close of the season, took the first ship to sea that ever was towed by steam from London; this ship was the Oxford, Capt. Lamb, bound to Bombay, 400 tons burthen, drawing fourteen feet water; she was taken out of a tier of vessels, from between two others, and carried off, against a strong spring flood tide.

During the summer of 1816, the British government had prepared a vessel, called the *Congo*, under Lieut. Tuckey, for exploring the river of the same name, on the west coast of Africa, and had employed Boulton & Watt, to put an engine into her, which these gentlemen had made, as a common overhead walking beam engine, and wagon boiler. When finished, the Congo was too deep in the water by nearly *three feet;* the wheels so drowned that they could scarcely move, and the whole matter so badly arranged, that it was found absolutely necessary to take out the engine and boiler, and to let the Congo do her best, without any help but that of sails and boats.—Among the *junior* officers, in the government dock yard at Deptford, where the Congo was fitted, the saying "*it is well to know what will not do,*" became a standing joke. Some of these young gentlemen furnished the writer with a few anecdotes, on these points, so super-

latively ludicrous, that if repeated at the present day, they would throw doubts upon the authenticity of this whole narrative.

Mr. James Watt was now near eighty years of age, but he had been too well schooled, and had too much judgment to be defeated by a failure, which arose principally from want of information among the government officers. Mr. Murdock, the undoubted inventor of the D slide valve, was at this period Mr. Watt's right hand man, and a Mr. James Brown was an assistant in the same concern, to say which, is enough to show that he was a man of talents. An old and meritorious officer in the British navy, named Wager, was sailing-master among the officers of the Warrior 74, the ship which conveyed the Prince of Orange home to Holland, in November, 1813, from which circumstance he became the leader, among the parties concerned in the Dutch patent, under which the *Defiance* was taken to Holland. He had navigated her across the North Sea, and retained the charge of her while in Holland. That vessel returning about this time, under his command, he was introduced to Mr. Watt, and employed by him to assist, with Mr. Murdock and Mr. Brown, in perfecting a nautical steam engine. To aid in this object, the Caledonia was purchased, her old engines and boilers taken out, and a set of experiments instituted, and pursued until August 1817, at a cost of £10,000 sterling, these led to a settled plan of construction, by which nautical engines were much improved. The Caledonia was a flat floored vessel, ninety-four feet long, fifteen feet wide, and eight feet six inches deep; the form of her bows very much that of the old fashioned box iron, used by housewives; the after body was finished by as clean a run as could be given from a flat bottom, to the form of the stern known as the pink stern; and when completed by Mr. Watt, she drew about four feet of water. The engines were made with two vertical cylinders; with pistons of short stroke; D slide valves between the cylinders and condensers, the latter occupied the middle portion of each engine; the slides set, to cut off at three-fourths the stroke, and to work one-fourth expansively; the piston rod connected, by a principal cross head, and two side rods, to two half-beams, one on each side the cylinder: these half-beams were placed as low down in the vessel, as would allow them to vibrate clear of the bottom, on gudgeons, one on each side of the condenser, the air pump, with rod and cross head, and two side rods to the half beams, being before the condenser. The top of the connecting rod took into a crank pin, in the face of a toothed wheel, the diameter of two feet; the two small toothed wheels were at opposite ends of a middle shaft, and the crank pins set at right angles to each other, and this geared into a toothed wheel, on the inner end of the paddle wheel shaft, whose diameter was three feet; thus the paddle wheel made two revolutions for every three strokes of the engine, and being made of a larger diameter than usual, it was expected that the wheel would have an increased power, without distressing the engine, by too quick or too slow a motion, either in smooth water or on the sea. The particulars of the dimensions, and the sizes of these several parts, have been mislaid by the writer; but it is remembered, that the Caledonia did not reach quite nine miles an hour, and it is

believed, that the cylinders were of two feet diameter and three feet stroke, and the wheels nearly thirteen feet diameter. Changes have since been made in the details, and greater results obtained, but the general form of the best English sea-going ship engines has not been materially altered, since this arrangement was first completed by Mr. Watt.

In the autumn of 1817, the Caledonia went to Holland for a short time, and was, soon after, sold to the celebrated Steen Billé, the admiral who commanded the Danish fleet at Copenhagen, during Nelson's attack, in April, 1801, and by him was employed for some years as a government packet, between Copenhagen and Kiel.

(*To be continued.*)

On the effect of Momentum on different Fluids, with experiments in refutation of the opinion of M. Thayer, as stated to the Institute of France.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the last number of this Journal a notice was given of some experiments by Prof. Johnson and Mr. Espy, exhibited to the Institute at one of their monthly conversations. The object of these experiments was to detect the fallacy of the deductions made by M. Thayer from these same experiments, stated to have been described to the Academy of Sciences at Paris, and detailed in the Revue Encyclopedique for September, 1833. The following is a more detailed account of these experiments.

Mr. Thayer had affirmed that if a glass cylinder, containing different fluids, such as water and oil, for example, be placed with its axis perpendicular on a whirling table, and made to revolve horizontally, these fluids would not take a position corresponding to their specific gravities, and the known laws of centrifugal force; but that the upper surface of the water, next the oil, would be convex—and the oil would assume the form of a double concave lens.

This anomalous effect, and many others similar, were attributed by the original experimenter, as he could not account for them on the known laws of inertia, to chemical attraction, and he proposed, at some future period, to investigate more at large these chemico-mechanical effects.

Two or three of these experiments were repeated, and the cause of the *anomalous* appearance was instantly detected to be the greater or less tenacity or viscidity of the different fluids used; for that which had a greater viscidity, acquired at the commencement of the revolution, a greater centrifugal force, in consequence of sooner partaking of the velocity of the jar; and that which had a less viscidity, acquired a less centrifugal force, and therefore the oil, for instance, did assume the lenticular shape mentioned above.

It was, however, discovered by continuing the motion of the whirling table uniformly for some time, that as the water gradually acquired

the velocity of the cylinder, its centrifugal force gradually overcame that of the oil, until the lower surface of the oil became convex, and the surface of the water contiguous to it, concave.

It was also perceived that this effect was increased as the velocity of revolution of the table was diminished, or its motion arrested; for the water being less viscid than the oil, retained its velocity longer, and thus it exhibited a much greater centrifugal force.

Another kind of supposed anomaly was exhibited, and proved to be equally well explained on known principles of equilibrium and motion in fluids. Suspending a jar containing two liquids, as before, and then giving it an oscillatory motion, the surface of separation of the two was perceived to incline alternately from one side to the other, according as the pendulum reached successively the two highest points of its course. Carrying the oscillations to very great arcs, so as nearly to pass into a complete revolution, the motion at the upper point was necessarily so slow as to allow gravity to reverse the position of the liquids in regard to the parts of the phial, and this effect took place even when the revolution was complete, unless the centrifugal force exceeded the gravity, in which case they both remained at their first positions in the vessel, the centrifugal force keeping the heavier fluid at the outer extremity of the circle.

The inclined position of the surface of separation when oscillating in small arcs, was referred to the greater momentum given to the heavier fluid, and the effect of inertia, by which it tends to continue its acquired motion after the vessel had attained its highest point in the arc.

If the explanation here given of the anomalies supposed to be discovered by M. Thayer, should meet his eye, it may save him the trouble of a laborious and fruitless investigation.

Apparatus for Freezing Water by the aid of Sulphuric Acid. By R. Hare, *M. D., Prof. of Chem. in the University of Pennsylvania. Communicated by the Author.**

The congelation of water by its own vaporization, accelerated by exposure to the absorbing power of sulphuric acid, or other agents, in vacuo, has always been a difficult experiment. A distinguished professor complained to me lately of want of success in his efforts to repeat it. In November, 1832, after having three times succeeded in freezing water by the process in question, yet having failed before my class, I was led to give more than usual attention to the process in order to obviate the causes of disappointment. It appeared to me that the failure arose from imperfections in the vacuum. An excellent pump, with perfectly air tight cocks, is indispensable; and not only must the pump be well made, it must likewise be in good order; Neither should the packing of the pistons, the valves, nor the cocks, allow the slightest leakage. If a pump has been used previously for

* Originally published in the Journal of the College of Pharmacy, Philada.

freezing, by the evaporization of ether, it will not be competent for the experiment in question, unless it be taken apart and cleaned.

Cocks of the ordinary construction are rarely, if ever, perfectly air tight, and their imperfection always increases with wear. Under these impressions, having cleansed my air pump, and put it into the best order possible, for the purpose of obviating leakage through the cocks associated with the instrument, I closed the hole in the centre of the air pump plate by a screw, and for a receiver made use of a bell glass, with a perforated neck, furnished with a brass cap, and a female screw, by means of which one of my valve cocks was attached. A communication between the bell, and the chambers of my pump, was established through the valve cock and a flexible lead pipe, in a mode analogous to that described in the account of the valve cock. Jour. Frank. Inst. vol. xi. p. 293. In this way I succeeded in preserving the vacuum, longer than when the cocks of the air pump were employed in the process; and accomplished the congelation of water by means of the vacuum and sulphuric acid.

Latterly, I have used an apparatus which is represented by the adjoining figure, in which a brass cover is made to close a large glass jar so as to be quite tight. In operating, the bottom of the jar was covered with sulphuric acid, and another jar with feet, also supplied with acid enough to make a stratum half an inch deep on the bottom, was introduced as represented. The bottom of the vessel last mentioned was, by means of the feet, kept at such a height above the surface of the acid in the outer jar, as not to touch it. Upon the surface of the glass vessel, a small piece of very thin sheet brass was placed, made concave in the middle, so as to hold a small quantity of water.

The brass cover was furnished with three valve cocks, one communicating with the air pump, another with a barometer gauge, and the third with a funnel supplied with water. Under these circumstances, having made a vacuum on a Saturday, I was enabled to freeze water situated on the brass, and to keep up the congelation till the Thursday following. As water in the state of ice evaporates, nearly as fast as when liquid, the whole quantity frozen would have entirely disappeared during the night, but for the assistance of a watchman whom I engaged to supply water at intervals. At a maximum I suppose the mass of ice was at times about two inches square, and from a quarter to a half an inch thick. The gradual introduction of the water, by aid of the funnel and valve cock, also of the pipe represented in the figure, by which it was conducted to the cavity in the sheet brass, enabled me to accumulate a much larger mass than I could have procured otherwise. The brass band which embraces the inner jaw near the brim, with the three straps proceeding from it, serves to keep this jar in a proper position; that is, in fact, concentric with the outer jar.

In this last mentioned experiment, I employed an air pump upon a new construction, which I have lately contrived, and of which I shall soon publish a description.

HARE'S APPARATUS FOR CONGEALING WATER.

FRANKLIN INSTITUTE.

Monthly Conversation Meeting.

The ninth Monthly Conversation Meeting of the Institute was held at their Hall on Thursday evening, June 26, 1834.

Two safety chest locks were exhibited by Mr. Zebulon Locke, of Philadelphia, and were much approved.

Benj. Slater & Co. of Philadelphia, submitted for examination two spring tempered hay forks, manufactured by N. B. Harlow, of North Bridgewater, Massachusetts, and a patent concave set scythe, from the works of J. Taswell & Co. Fitchbury, Massachusetts.

Wm. Loomis, of Ashford, Connecticut, brought forward the model of a machine called by him "a helping power machine," the properties of which it is believed were sufficiently discussed to enable the inventor to draw correct conclusions in regard to the machine.

A. C. Jones, of Philadelphia, showed the saponaceous qualities of the bark of a tree, from Chili, specimens of which he produced.

John B. Jewell placed for examination a bottle which had been deposited in the copper ball of the State House (Philada.) steeple, and in which had been inclosed a parchment roll containing sundry particulars of the kind usually thus placed. The wax which covered the cork of the bottle was entirely removed, and water had obtained access to its interior, and converted the parchment into a pulp.

Prof. Bache showed the method of using the syphon proposed by Thomas Ewbank, of New York, in the June number of the Journal of the Institute; he also exhibited the apparatus invented by Prof. Œrsted, of Copenhagen, for showing the compressibility of water; the article of apparatus forming part of the collection of the University of Pennsylvania.

On some of the means of Elevating the Character of the Working Classes. A Lecture delivered at the close of the Winter Course, 1833–34, *of the Franklin Institute of Philadelphia. By* J. K. Mitchell, M.D. *Prof. of Chem. Applied to the Arts. Frank. Inst.**

It is not usually in good taste, to come before a class, with an apology for an imperfect state of preparation. Circumstances will justify me in so doing, in the present instance, as I now appear before you, not of my *own* accord, but in compliance with a request made only a few days ago. Sufficient time has not been given, even if it were *all* at my disposal, to compose a dissertation worthy of the occasion, much less could it be done in the few hours of release from the calls of a restless profession. Such as it is, however, I present it to you, with the confidence, warranted by your invariable kindness to your teachers, that it will not be subjected to the rigorous rules of criticism, but that, even without any explanatory excuse, you would make all necessary allowance for defects, and dwell rather upon the

* Published at the request of the Committee on Instruction.

goodness of the intention, than upon the imperfections of the execution.

The subject which appears most suited to an occasion like the present, is the mechanic character,—the causes of its actual and former condition—and the means of elevating it, so as to place the operative arts, on the same platform with professional pursuits. If, in executing this task, I should probe harshly the wounds which I am preparing to heal, I trust that the love of truth, and the desire for improvement, hitherto so strongly displayed by this class, will not desert it, at the very time when a full share of both, will be necessary to the process of restoration. That I have a very sincere desire to improve, and exalt, the condition of the working classes, cannot *now*, I should suppose, be doubted by any of you. I have laboured long enough, too, among the dust, and smoke of a laboratory, to feel myself entitled to the appellation of a workman; and while so engaged, have not been able to perceive any necessary connexion between manual labour and degradation; any essential disjunction of the work of the hands from that of the head; any law of nature which should make impossible, or even difficult, an alliance of good manners, high morals, and elegant accomplishments, with the active duties of the mechanic. On the other hand, I constantly perceive the immense value of all these things to the workman. He cannot bring superfluous talent to his work, however simple habit may make it appear; he cannot have too much of that patience and self-denial which are found most highly cultivated in the most polished circles; and in his dealings with his customers on the one hand, and his workmen, or fellow labourers, on the other, he will unquestionably find educated politeness, and habitual self-possession, the means of wealth, and the sources of affection and obedience. There is no one *good* quality of the gentleman which can sit ill on the mechanic, however poor he may be; this is abundantly manifested in Philadelphia, where many of the productive class, are found possessed of every gentleman-like accomplishment, and enriched and exalted by them in a way which ought to convince every one of their great importance, even in the promotion of the objects of business, and the accumulation of fortune.

In all simple and inartificial communities, persons skilled in any kind of workmanship, were held in high estimation. Even among the celestials, the amusing mythology of the Greeks had placed a working divinity; and Vulcan, though soiled by his profession, and devoted to labour, was not the less a god on that account. Aaron, although the brother of the first of the prophets, seems, in the construction of the golden calf, and of the serpents, to have applied a remarkable degree of mechanical skill. The highly educated, eloquent, logical St. Paul, was trained to the business of a tentmaker; and the *Saviour of the World*, who had been apparently carefully educated in the learning of the times, handled the axe and the saw. These, with examples nearer our own time, presented by Franklin, Fulton, Rittenhouse, and many others, show, that in the employment of the hands, there is no natural degradation, and that,

whatever may be the artificial prejudices now prevalent on this subject, manual professions may be followed consistently with the possession of every noble, and every literary qualification; and that the business duties of the mechanic are not to exempt him from the contribution of his share to the literary repute and worth of his country.

That this is not a common opinion, is unfortunately true; that it is an unwarrantable opinion, is unquestionably false. To show this in the stronger light, let us consider the causes of the present condition of the working classes, and we shall then be better able to indicate the remedies.

During the existence of the feudal system, the working classes were either the slaves, or the essential dependents of the owners of the soil. Their vassalage necessarily degraded them. Labouring exclusively for the pleasure, or interest of others, they looked upon employment as a task, the *conclusion* of which was alone agreeable, and which could not excite curiosity, or bestow satisfaction. In any event, the reward of the toil, if it happened to pass into the hands of the artisan, was insecure, because laws were then made chiefly for the protection and convenience of those who enacted them; and *they* were seldom, if ever, men who could not boast of a long line of ennobled ancestry. A sense of constant dependance—a ceaseless feeling of insecurity—create servile habits, low cunning, and habitual deference towards the sources of power and protection.

Under the most favourable circumstances, the artisan became the resident of some town or city, which had procured from royal bounty, or interest, or policy, certain immunities. But even there the tenor of the times scarcely suffered him to escape from the thraldom incident to his occupation. Either the town was subject to the overshadowing power of some neighbouring baron, to whom it paid fealty for the sake of peace or protection; or, it was under the control of petty tyrants, the offspring of corporation acts or customs, who lorded it over their fellows with that arrogance and cruelty, which we so often see exercised by those who have but recently acquired power and consequence.

Incapable of securing either wealth or station, it was scarcely to be expected that the working classes of that age, would covet, or obtain the advantages of mental cultivation; or that the education of themselves, or their children, would become an object of much importance. Even if desirable, education, as we now understand the term, was inaccessible to almost all of them. Learning, contradistinguished from science, was the fashion of the age; and, confined chiefly to the monasteries, it was hardly attainable even by the nobility. But such as it was, the learning of that period, could have been of little use to the artisan, in the pursuit, or improvement, of his profession. Inductive philosophy, the creature of the genius of Bacon, and the great light of the arts in our time, had not yet been born; and science might have sought in vain, amidst the false lustre of the school of subtleties, for one single ray of true practical knowledge. All the influences, therefore, of the times were adverse to the mechanic. There existed no consequence but that of the noble, or the

monk; no security, but that of hereditary power; no accumulation but that by the king or the baron; no education but that which, inaccessible to the artisan, could not, if attainable, have elevated his intelligence, or illuminated his pursuits. It is not, therefore, so much a matter of surprise, that he sunk into ignorance and degradation, as that, in spite of such sinister influence, he should have been able to sustain so much respectability, and to contribute so much to the advancement of the manual arts.

A pursuit, essentially dependent, affording no security for its gains, and unadorned with the lustre of education, is never adopted by any but such as are driven to it by necessity, or inured to it by habit. It is therefore followed, usually, by low and vulgar minds, and is consequently in danger of becoming still more degraded in their hands. It was so with the mechanic arts, and their cultivators, down to that period, when a great variety of causes, political, moral, and religious, began to react on the monopolists of privilege and power, and brought the people into the possession of a share of both. Among the most influential of these causes, was the growth of great towns. As a community becomes more extensive, individuals lose their prominency, and the public is more conspicuous. Units are merged in aggregates; and as the mechanic was lost from sight in the vast mass of human beings, he was left to the less fettered pursuit of his business, and his happiness. He was more at ease, and, of course, more industrious. He was surer of his gains, and consequently more eager to embrace all the means of acquisition. He felt that education could be made a source of distinction, and as it was now attainable, he sought it, both for pleasure and profit. A common cause, a general interest, often brought him for the sake of gain, or the repulsion of invasion, civil, and military, into concurrent action with the merchant, the lawyer, and the physician; men who had long before him broken through the barriers of exclusive privilege, and asserted *their* claims to a share of education and refinement. Such association could not fail farther to increase the nominal, as well as real, importance, of the mechanic, and to add to his social value, as well as his intellectual culture.

Yet even under the most favourable position assumable in Europe, even now, the mechanic is exposed to the deteriorating agency of many artificial arrangements. Subjected to a long apprenticeship, he must begin his course of manual labour at least as early as thirteen, and is of course debarred from acquiring that kind of education, which is to him of the most vital importance—a *philosophical* education. That is not attainable at so early an age. A very great many of the towns of the civilized part of the old world, are incorporated, so as to exclude from the exercise of an art, those who have not inherited, or bought its "freedom," even though regularly indented, and legally authorized to practice it elsewhere. Besides, the artificial distinctions in the society of these countries, are perpetuated as well by law as custom, and a tradesman there is scarcely yet tolerated in using the dress and the habits of what they call the better classes.

These numerous artificial causes have had the effect of creating a degraded estimate of the value of the mechanical professions, which has travelled across the Atlantic to us, and like many other of the feudal and aristocratical falsities of Europe, has been unfortunately ingrafted into the very substance of society in this country. It is for this reason that some callings are esteemed more genteel than others, which are as intrinsically noble and useful. You well know that the profession of the lawyer or the doctor, though properly speaking unproductive, is esteemed more honourable than that of the mason, the carpenter, or the blacksmith, which is continually promoting the wealth and the power of society.

Thus far, then, the mechanics are not censurable for holding, in the scale of society, a station inferior to that to which, by their wealth, numbers, political consequence, and public usefulness, they should be entitled. But it is not in accordance with the good sense, good feeling, and love of justice, so conspicuous in the American character, to continue the pressure of the odium of a *caste*, unless the people upon whom it weighs, by neglecting the means of escape from it themselves, become voluntary sufferers, and rivet the fetters thrown around them by ancient usage and imported prejudice. If, then, the American mechanic is not yet, however truly estimable, rated as he ought to be, the cause will be found, most probably, *in his own hands.*

If we carefully weigh the conditions essential to the honourable reputation of any profession, or class of individuals, they will be found chiefly in the degree of moral cultivation demanded either by usage or by business. For this reason, the divine, the lawyer, and the physician, pursue avocations held in the highest respect in every country where they are really learned professions. In these employments, the books to be consulted are numerous, and many of them in foreign or dead languages. To the due comprehension of these, a good preliminary education is indispensable. The gentlemen therefore of law, divinity, and medicine, are generally possessed of a considerable degree of classical learning, which, elevating their taste, and refining their sentiments, renders them both agreeable and instructive companions, and makes them welcome, as such, to the best society, of which they become an essential and important part. But to the successful cultivation of most, if not all, of the mechanic arts, a preliminary education, beyond the mere elements of the vernacular language, has unfortunately not been esteemed necessary; and hence, as a class, mechanics have not been noted for those companionable qualities, which, giving zest and grace to society, render their possessor a desirable acquisition. How seldom is a youth, destined for a handicraft business, found passing through the ordinary routine of a college course, or employed in the acquisition of the foreign languages, in which may be found written much which, as an artist, it would import him to know. The loss thus sustained, is of much greater importance than, on a superficial observation, may be made to appear. It is in the gentle breast of tractable childhood, that we must plant the seeds of the tender and delicate sentiments. It is then

alone that the mind receives a graceful flexibility, and imbibes a taste for elegant pursuits, and refined sentiments. Our original nature is so rough, selfish, and cold, that it requires years of sentimental cultivation, to tutor it into the smoothness, self-denial, and generous warmth, so essential to the harmony, the elegance, and the interest, of social intercourse. This is almost instantly perceived by an uneducated man, when brought, by the force of circumstances, into the presence of those who have enjoyed the invaluable blessing of a good education. If he is observant, he will be forcibly struck with the charms of good society, and will lament, as thousands have done, that the opportunity of acquiring such things is gone, gone for ever. Although there are men so constituted by nature, as to need little polish from the study of the schools, and the example of cultivated minds, they are not common;—and the fine lines of Pope will be found generally true—

> "'Tis education forms the *common* mind;
> Just as the *twig is bent* the tree's inclined."

When we carefully examine this passage, we are struck with the exception implied by the word "common." Pope, who has written on the ruling passion, knew well, that men of peculiar moral conformation, could not be formed by education, but used education for the promotion of favourite pursuits. Examples of men rising superior to the obstacles of ignorance and poverty, into a surprising degree of consequence, are however much more common, than those of escape from the contamination of early bad-manners, to agreeable ease, and acceptable social elegance. But even such instances, if more common, should not prevent a parent who designs his son for a mechanical pursuit, from giving him, if practicable, a good classical education. Such a course would appear singular at first, but if generally followed, would cease to attract notice; and the favourable difference in the social consequence of a highly educated mechanic, would attract a crowd of imitators; and after no very protracted period, the artificial barrier now left standing between various classes of society, would be broken down; and the last relics of our feudal origin, and transatlantic prejudices would be extinguished. That, however, must be done by the mechanics themselves. They must cultivate the means of advancement, to be advanced; and cannot rationally complain, if, having deprived their sons of the ordinary accomplishments of good society, they should be kept out of it by a sense of their own inferiority, or the good taste of those who compose it.

It may be said that a mechanic has not *time* for the pursuit of classical and elegant literature, and that, if possessed, it could not promote the interests of his business. There *is* time. If a boy, whose mind has been disciplined by education, and whose intellect has been sharpened by exercise in the schools, be finally sent to the study of a trade, he will not only learn it in a shorter time, but he will learn it better, less mechanically, and more intellectually. It will scarcely be denied that as much time is necessary to learn the

science of medicine, as to acquire a knowledge of any other art whatever; yet we perceive, that in three or four years, a clever student of physic possesses himself of an amount of science, which would appear incredible to one unused to the acquisitive power of early training, and habitual mental exertion. The preliminary moral *gymnasium* of his classical schools, gives such force, flexibility, and retentiveness to his faculties, as to enable him to do, in three or four years, what, without such preparation, he could not, even if at all possible, accomplish in twice as many.

If such an education were usual with mechanics, it would afford them a new and elegant recreation, without diminishing their zeal for their art. And as their art would, by such means, become itself more respectable, they would not feel themselves degraded in its pursuit. In a solitary road of upper Virginia, I was attracted by the appearance of a Yankee pedlar, who, with great enthusiasm, recited verses from a copy of Virgil, descriptive of a scene similar to a very striking one then before him. I naturally inquired into the history of such an individual, so engaged. He informed me that his father had given him a good classical and philosophical education, and had brought him up to the business of a tin smith. At this trade he had worked assiduously for many years, during which he had beguiled his hours of leisure by classical reading. "Virgil, Sir," said he, "is my favourite author, and I never go on a journey without him. He is good company. He shortens the way, enlivens an evening or a rainy day at a tavern, and enables me to bear better the usual adversities of my diversified life. I make my tins myself, harness my horse, load my wagon, and journey now and then to the south to sell them." Here you see that a classical scholar, a man of taste, in fact a cultivated philosopher, was not ashamed to pursue a very common mechanical business, and he did it with skill and attention. It was the custom of his home, familiar to him, and it elevated not only the individual but the business. *Time* too had been found, not only by him, but many others in his neighbourhood, to educate themselves classically before they entered on a trade. It does not appear that their time was lost, even with reference to their business, since they were quite as skilful in it as those who went to it early, and brought less sharpened understandings to the work.

Even if *money* were the *sole* object of life, the chance of its attainment would not be lessened by a good preliminary education. But money can be valued properly only as the means of obtaining rational enjoyment. If, then, in a refined education, are found new sources of pleasure, new powers of promoting happiness, and respectability, we have one of the best things that money can buy—a good, too, not as easily lost as money, and which, after our youth has gone by, cannot be purchased by the wealth of the world.—Bodily activity is so natural to youth, that all young animals are, when awake, in constant motion. It is almost impossible for one of riper years to follow a child through the evolutions of a single day. The little fellow, obedient to impulse, exerts every muscle, stimulates every nerve, trains every member, and every sense, for future use,

and happily seldom requires either solicitation or instruction, to prepare himself *physically* for his part in the drama of life. Nor does nature forget to train, at the same time, his moral powers. The acquisition of knowledge made by the time a child reaches the end of its third year, is stupendous. But while the muscular education goes on as rapidly as ever, the moral exertion begins, from that period, to decline, and a less stimulated curiosity exerts over the mental faculties a less active control; and unless a systematic education be substituted for the waning discipline of nature, the mind becomes listless and less enterprizing, loses its habitual acuteness, and presents to the observer the man of nature, such as our aboriginal people, active, strong, cunning, incurious, ready for war, for hunting, or the dance, but averse to moral labour, and insusceptible of all the softer and more elevated enjoyments of life.

The want of that cultivation, which, by exciting his more tender and graceful sentiments, best fits a man for the society of females, while it steals from him the sweetest and purest enjoyments, deprives those who have a right to expect better things at his hands, of all that delightful intercourse, which classical taste, and literary refinement can alone produce. Sensible of this, coarse and vulgar men are seldom found, at night-fall, within the precincts of home. Incapable of entering into the feelings, or of participating in the gentle pleasures of domestic life, they are found congregated together in lodges, at taverns, at shows, or theatres, or in any place where they may find refuge from vacuity in strong excitement. Their women are left to themselves, and all of a father which his child can know, is as an eating animal at meal times, and an absentee at night. Such is the result of a want of refined education in any class, or in almost any individual; and if large, and very important sections of society, voluntarily abstain from such improvement of themselves and their children, although they may occasionally present, as I *know* they do, many very honourable examples to the contrary, yet, as a class, they must suffer loss, both in the means of happiness, and the estimation of society.

The neglect of classical education, among those to whom it was formerly deemed an indispensable accomplishment, is among the most alarming signs of a decay in one of the most interesting departments of American civilization. By degrees, merchants and others engaged in pursuits not immediately dependant on classical learning, have imbibed the opinion, that an acquaintance with elegant literature disqualifies a man for business, and that few of those who have a classical taste or predilection, succeed in the active duties of life. It is true, that when a man gives *superior* attention to his amusements of any kind, and postpones his occupation and his interest, for his pleasures, he will fall short of success. A theatre—a grog-shop—a club, may also trench too much on a man's time and attention, and work his ruin more effectually than Milton or Homer, and that too without leaving him those bright fragments of enjoyment which, amidst broken fortunes, remain for him who has preserved his innocency and

his taste. The objections to learning, like the objections to all that is good in itself, are necessarily derived solely from its abuse, and ought not to militate against its use. In Europe, many of the merchants, whose financial skill has filled the world with their renown, are men of high finish and elegant accomplishments; and in Boston, it is a very common thing to find the student of Greek and Latin classics, in the compting-house, there distinguished for the skilfulness of his speculations, and the wealth acquired by his wisdom. With us, unfortunately, the opinion of its hurtfulness leaves us but few opportunities to judge of its value, and unless we soon divest ourselves of this absurd prejudice, we shall not be able to find at home, the seminaries in which it will be possible to recover our lost ground. Already they present strong symptoms of decay, and in a few years, unless the working classes will in this, as they do now in many other things, set a noble example to those who have voluntarily divested themselves of the only rational ground of distinction, our colleges and classical schools must entirely disappear. In the city of Philadelphia, there are probably not less than thirty thousand families. If in each of one-third of these families, there exists one young man of a fit age for college, we have at least from five to ten thousand young men qualified by age, at least, to be in the course of education in such an institution. But will it not surprise you when I say, that Philadelphia does not send to all the colleges of the Union, a number of young men sufficient, if collected together, to well support one single institution. Since I have been familiar with this subject, there have not been more than one hundred and fifty youths of Philadelphia, at one time, at all the colleges of the Union. Nor has this arisen from a deficiency of skill in the professors, either here or elsewhere. At this moment, our own University is rich in the means of instruction, and at a rate which would not tax severely the purse of the poorest master-mechanic; and I *do* trust that, in a very few years, the Institution, in whose Hall I now address you, will present still cheaper access to elegant, as it now does to scientific education.

Amidst so many things to admire in us and our institutions, even the most friendly foreigner observes with regret our deficiency in elegant literature, and the consequent infrequency of writers of taste. We are free, well informed, industrious, affluent, ingenious; but we are grave, deficient in enthusiasm, and almost wanting in the higher graces of conversation and literature, to which society owes, elsewhere, its greatest charm, and without which, we lose much of the sweetest enjoyments of life. Much as I love my home, greatly as, on the whole, I prefer this, my native land, to every other, and I have seen them nearly all, still, knowing as I do, the great enjoyment to be found in that society where the mind of almost every one is refined by acquaintance with the polite writers of every age and country, I cannot resist the feeling of regret at the loss we voluntarily incur, nor can I refrain from expressing the hope, that the time is not far distant, when high refinement, and manual labour will not be found incompatible, and when *our mechanics* will be entitled, *in the very best sense of the word*, to the name of *gentlemen*. Coarseness

and vulgarity are disgusting, even to the vulgar, for there is no man, however gross himself, who does not feel pleased at the improved manners and literary attainments of his son; just as there scarcely ever existed a drunkard who did not love to see his child averse to the destructive vice to which he had himself become the victim.

Highly as we may estimate classical education, as a means for the advancement of the happiness, the worth, and the companionableness of the mechanic, there is another department of learning, still more essential to his professional interests. Science, as contradistinguished from learning, enters into every, even the humblest and simplest mechanical occupation. Not to mention those trades in which it is obviously applicable, such as instrument making, clock making, machine making, &c., men engaged in leather dressing, dying, tanning, fulling, &c. are constantly employing scientific processes, and do this better, or worse, with more or less prospect of inventive, or judicious results, according to the greater or less familiarity with their principles.

That mechanics have not closely studied philosophy, is attributable chiefly to the thraldom of prejudice, and the disabilities which, created in feudal times, are not yet removed, even in our own age and country. In other countries, and at a more remote period, philosophy was the privilege of but a few, to whom hereditary wealth, or professional necessity brought the boon. *Experimental* philosophy, at least, was taught in but a few expensive seats of learning, to which scarcely any one but a member of the hereditary aristocracy, could find access on any terms. It was then impossible for a boy, devoted by his pursuits to any manual occupation, to obtain admittance to such places of instruction, and, *if* possible, the enormous expense operated as a preventive; for if that could be afforded, the then profits of the anticipated trade would have rendered it inexpedient. That which was, in former ages, a necessary ignorance, became, as it were, a badge of degradation, and illiteracy and labour were so commonly united, as to be esteemed inseparable.

So hurtful is this evil, in the eyes of some of the greatest men now alive, that they have almost devoted themselves to the duty of enlightening and reforming a class essentially the most important to the interests and welfare of society. Lord Brougham, Dr. Birkbeck, &c. are now labouring hard to make knowledge cheap and accessible, and to persuade the artificers of all kinds to throw off the shackles of the worst description of tyranny, that of professional ignorance and apathy. In this they have succeeded to a very remarkable degree, and while we are boasting of the revolution which gave us the mastery of ourselves, we are submitting, even yet, to the most degrading influence of the mechanical and aristocratic institutions of the country from which we were delivered, and I fear, permitting the people from whom we separated to outstrip us in that kind of knowledge which is the true source of individual advancement and national prosperity.

Within a very few years, however, a new spirit begins to pervade the labouring classes of our city, and at length, desirous of advancing to the station long since accorded to them by our national insti-

tutions, they seem resolved to prepare themselves for their professions, in the same philosophic manner as the divine, the lawyer, or the physician. This is as it should be; for otherwise it would appear singular to boast of our national independence in language which, itself expressive of ignorance, betrays the lamentable dependence on foreign influences of the basest and most dishonourable character. The time has at length I hope come, when *profession* will be no longer a plea for *ignorance*, or *trade* an excuse for *coarseness* and *rudeness*. Henceforth, a mechanic, ignorant of the principles on which his art is founded, will scarcely be better tolerated than would a physician who should dare to practice his art, when convicted of ignorance of the philosophy of the circulation of the blood. While debarred the schools of science, by the exclusiveness of the aristocrat, or the high price of learning, he might be pardoned for an unavoidable ignorance; but now, when science opens her arms to receive him, and beckons him to her temple, he must enter her honourable courts, or blame himself alone for his exclusion. And if despised by those who have embraced the rejected opportunities, he finds himself lowered on the scale of society, let him remember that, in our country at least, it is impossible to support long any other distinctions than those of talent and learning, and that *he* will be considered most noble, who is so indeed, and *he* most agreeable and most welcome, who by great cultivation, has possessed himself of the affluence of the powers of pleasing. The revolution begun in '76, will not be completed until the artificial barriers of society, instituted in Europe, have been entirely overthrown; and that can be done solely through that cultivation which will render them unnecessary. In Europe, a vulgar and ignorant man may be found among an hereditary aristocracy, and be sustained by the privileges of his class; but here, such distinctions have happily vanished, and such a man will, whatever his wealth, or his profession, sink into merited contempt.

I feel greatly encouraged by the zealous and untiring pursuit of knowledge evinced in the class I am now addressing. Every night, regardless of the inclemency of the weather, you have filled this spacious hall to its very walls, and have expressed no impatience at demonstrations necessarily prolonged, and often deficient in direct interest. All this augurs well for the future, and promises us a harvest, of which the good seed will be again sown for future increase. Let the mechanics of one generation be, as they should be, philosophically educated, and, in America at least, such an education will become forever indispensable. You have, therefore a double incentive to exertion. Your own respectability and interest, and the elevation of the character and pursuits of your successors for all future time, seem to be now in your hands, and in improving yourselves, you will benefit and exalt your country.

If the magnificent bequest of the late Mr. Girard should be applied as it ought to be, I think the mechanics will receive an impulse from an unexpected quarter. It is now almost certain that the orphan children who are to enter the Girard College, will be carefully educated in classical learning, and fundamental philosophy, and will most of

them afterwards engage in operative pursuits. They will soon form a numerous body of mechanics of the very best quality, and render an equally good education imperative to others; for be assured, as you may be by the many fine examples already among yourselves, that exactly in proportion to the intelligence and skill of the workman, will be his success in business. The doctor may practice unworthily, yet extensively, his hidden art; the merchant may, by good fortune, succeed, without education, in his adventures abroad, and his speculations at home; but the mechanic must, in his less eventful occupation, depend for success on his merit and his skill, and these will be proportionate to his natural and his *cultivated* faculties. His defects, if they exist, cannot be concealed, and his good qualities must be apparent in his productions. These always speak an intelligible language, and are generally of a very obvious character.

Every thing around us which relates to the advancement of the operative arts, is of an auspicious character. That is, indeed, amidst the existing tendency to the decline of literature amongst us, a subject of unfeigned exultation, because it is not possible that a general scientific movement on the part of the mechanics, should be unaccompanied by an improvement in the education of every other class of society. That part of society which has unfortunately been permitted to monopolize the classical distinctions, will not tamely see you transcend them in science, but entering on a very honourable and profitable competition, brighten themselves and stimulate you. This is the only warfare which should be conducted by various classes of society, among us, and its end should be the triumphant success of all.

It is vain for one section of society, in our country at least, to envy another its superiority or its influence These follow knowledge and manners as naturally as the brightening of the face of the landscape does the rising of the morning sun of spring. By numbers, a set of educated men may be divested of power, or consequence, but it will only be to put another set of the very same kind in their places, and those who have made the change, if themselves uneducated, will not be benefited by the alteration. While society maintains the forms of orderly government, such is the case in all free communities. Monarchies and oligarchies present occasional exceptions, and sometimes during the reign of civil commotion, spirits, from the vasty depths of ignorance, rise, through extraordinary force of character, to ephemeral exaltation. Sooner or later, however, the natural tide of events flows on, and those best qualified to guide the councils, and direct the destinies of society, will be found at the helm, through the spontaneous choice, too, of those who have not prepared *themselves* for the station. To obtain a share of power, to become eligible companions, welcome associates, to raise the credit of the class, and wipe off from it the involuntary stains brought from feudal times, and foreign countries, and to remove the badges of mental degradation, voluntarily assumed even here, the mechanics must not waste the time in unavailing regrets, and useless jealousies, but, buckling on the armour of learning, and seizing the sword of science, advance

to the combat for an equal station, with that ardour which must conquer, and that knowledge which will make the victory honourable to themselves and glorious to the country—the whole country—and I was going to say, nothing but the country. But no! no! that will be a victory auspicious to the *world.* So grand a spectacle is seldom seen in the universe. A whole community of mechanics, refined by literature, polished by good society, illuminated by philosophy, enjoying *all* the pleasures and honours of education, and carrying the arts irresistibly forward, to a degree of excellence of which the present age, with all its hurrying progression, sees but the beginning. That cause, once well begun, can have no limits but those of the world, no overthrow but that which must come to all things, when "*Time* shall be no longer."

So truly honourable a result, will throw back great reflective credit on the institutions in which originated the efforts for melioration: and among such institutions, none will probably, in our country, hold a higher rank than the *Franklin Institute of Pennsylvania.* It is but a very few years since a small number of individuals, most of them yet young, conceived the idea of affording, at a cheap rate, the sciences to the working classes, and all others who might be unable to apply to more expensive places of learning. With almost incredible zeal, did they collect the funds, and erect on a lot purchased in a central situation, the noble edifice in which I have now the honour of addressing you. A Board of Managers was elected, a Committee of Instruction appointed, and the best teachers sought for and found. Many of you must remember the zeal and skill with which Doctor Thomas P. Jones conducted the course of experimental philosophy, and practical mechanics; and with how much admirable science Professor Keating combined the power of throwing charms around the processes and the theories of chemistry. Professor Franklin Bache,* who followed him, is yet agreeably remembered for his profound knowledge, exact method, and exemplary precision; for the efforts which he made to call your attention from the striking experiment to its connexion with, and illustration of, the great principles of the science. Of the deep research, and instructive course of my present fellow labourer, Professor Johnson,† I could say much which would meet with a ready response from a class, which has acquired the title to estimate their merits, and unquestionably is inclined to fully appreciate their great desert. At the call of the government, Mr. Franklin Peale‡ has gone abroad to examine and report on the processes pursued in the mints of other countries, and for the past season we have been deprived of his ingenious, amusing, and instructive lectures. But Doctor Emerson,§ and Mr. Millington,‖ have filled up his evening by discourses at once improving to you, and most creditable to themselves.

It is not alone, however, to the lecture-room that the merit of the Franklin Institute is confined. Through the aid of the committee on publications,¶ and the variety and extent of his own accomplishments,

* Now. Prof. of Chem. and Pharm in the College of Pharm. † Prof. of Nat. Philos.
‡ Lect. on Practical Mechanics. § On Meteorology. ‖ On Astronomy.
¶ *Committee on Publications.*—Prof. A. D. Bache, Isaac Hays, M. D., S. V. Merrick, M. W. Baldwin, Rufus Tyler.

Dr. Jones is enabled to conduct, in the name of the institution, a *Journal* remarkably well calculated for the promotion of knowledge among mechanics, and the furtherance of the scientific reputation of the country. That Journal is not only read with advantage at home, but is often, in the most flattering manner, quoted by the best scientific journals abroad. It has continued, for several years, an unwearied flight, and, as yet, has moulted no feather of its well-earned reputation. I need not fear reasonable contradiction when I say that no similar institution has sustained so long, and so well, an equal magazine.

In addition to these claims to public estimation, the Franklin Institute has conducted, and is now conducting, toilsome and very expensive experiments on some of the most important questions in practical science. With much labour, and great expense, experiments have been made on most of the requisites of water wheels and adjutages,* so as to finally settle a point of great importance to every one who employs water power in the movement of machinery of any kind. The unfinished report of the committee on this subject, is a masterpiece of its kind.

The investigation of, and report on, weights and measures,† made by request of the House of Representatives of the State of Pennsylvania, adds a new claim, on the part of the institution, to public approbation, while the committee on steam explosions,‡ will soon put in another, of no inconsiderable weight, for an indefatigable, hazardous, and expensive series of experiments, under the patronage of the government of the United States, most ingeniously diversified. A very great deal of the labour and skill applied to these investigations, has been bestowed by private members of the Institute, unpaid, and without any other motive than that of doing good to society.

I have made this exposition of the doings of the Franklin Institute, not for the vanity of the display, but for the sake of justice, and example. Our own citizens, perhaps even the members of the Institute, have not been fully aware of the extent, variety, and importance of its public services, nor acquainted with the honourable nature of its claim to the support and countenance of our community.

It might be supposed that I had now stated all the merits of the Institution; but when I look to the left, and see before me a large proportion of females, attentively engaged in receiving instruction, I cannot refrain from exulting in the prospect of great gain from their example, as well as their improvement. It has been said, and I believe most justly, that the character of the child is formed or deformed by the example and instruction of the mother. She is intrusted with the discipline of thought, at that critical period of life,

* *Committee on Water Power.*—S. V. Merrick, Benj. Reeves, Isaiah Lukens, Rufus Tyler, Andrew Young, M. W. Baldwin, John Levering, John Agnew, Saml. Hains, Jas. P. Espy, Fredk. Graff, James. J. Rush, W. H. Keating, Prof. Alex. D. Bache.

† *Committee on Weights and Measures.*—Prof. Alex. D. Bache, S. V. Merrick, W. H. Keating, Rufus Tyler, M. W. Baldwin, Benj. Say, Asa Spencer, Abrm. Miller, Thos. P. Jones, M. D., Prof. Robt. M. Patterson, S. C. Walker, Benj. Stancliff, Thos. M'Ewen, M. D., Edm. Draper, David H. Mason, Benj. Reeves, Fredk. Fraley, Saml. Hains, Saml. Moore, M. D.

‡ *Committee on the Explosions of Steam Boilers.*—Prof. Alex. D. Bache, Prof. Robt. Hare, S. V. Merrick, W. H. Keating, Isaiah Lukens, Jas. J. Rush, Jas. Ronaldson, Fredk. Graff, Prof. Robert M. Patterson, Prof. J. K. Mitchell, Benj. Reeves, George Fox, Thos. P. Jones, M. D., Prof. W. R. Johnson, M. W. Baldwin, James P. Espy, Geo. Merrick.

when, through the flexibility of the mind, a bent is easily given to character, and the young ideas just begin to shoot. It is her care to protect the tender blossoms of thought and feeling, to prune rank luxuriancy, encourage honourable sentiment, and kindle the love of labour, and the taste for learning. She should not be found often unable to satisfy the curiosity of her child; nor should his eager thirst after knowledge be destroyed by the oft repeated declaration of impatient ignorance. How many Newtons have been withered in the bud—how many Franklins consigned to obscurity by the presence and the influence of a mother, who, herself totally ignorant of the value of knowledge, feels no disposition to encourage in her child, the love of science, or a taste for the arts!—Oh! if a mother in *feeling*, ought she not to long to brighten in the bosom of her child, a taste, which, while it will afford him many an hour of delightful recreation, and open to him an agreeable path to honourable distinction and public usefulness, will also shield him from the thousand snares of vice set for the idle, the ignorant, and the obscure. But more! many, very many of those who now hear me, pursue the creditable and useful profession of *teaching*, and are, like the honey-bee on his flowery embassy, abstracting the sweets of learning, to carry them home to a busy and eager school, to be again scattered far and wide, for the benefit of society. This is the compound interest of learning—the field which produces a thousand fold.

Let Philadelphia, justly proud of this Institution, so munificent of good, continue to carefully foster it; and let the mechanics, to whom it more especially belongs, forget not, that it is the first great step of their advancement to their proper station in society, and cherish it as at once most useful to them, and most creditable to their character.

If we should, by the permission of a kind Providence, again meet in this place, you will find me prepared to extend and improve the system of instruction in my department. I have caused to be made models of buildings, and implements used in the arts, which, for want of time, I could not exhibit during the present session. In the next course, I shall be able to present to you the interior of the glass-house, the pottery, and the iron-furnace, displayed in sectional models, in which will be made readily comprehensible, the various processes by which glass, china-ware, and iron, are produced. I have no doubt that my able colleague will make at least equal exertion to improve and extend *his* course, and that the next season will greatly exceed the last, in the value and variety of its instruction.

The least agreeable part of my task remains. I am now to take a final leave of you for the season. In doing so, let me not forget to thank you for the polite and quiet attention paid to my feeble endeavours to please and instruct you; for the patience with which you have borne disquisitions necessarily tedious, the respectful silence during the hour of lecture, and the avoidance, at its close, of any noisy demonstration of a satisfaction, not unknown to your teacher, but conveyed in a manner worthy of the place, of yourselves, and of the cause of science. These things console me for the toil, expense,

and inconvenience, of a course, which, under the pressure of heavy professional engagements, has not been conducted in such a manner as either to benefit my purse, or economise my exertion. Yet, thanks to you, I feel amply compensated for these sacrifices, by the persuasion that society is benefited, and that you are kind enough to be satisfied with my exertions.

And now, permit me to wish you a prosperous summer, useful, agreeable, and profitable pursuits, and a return to the course of the next season, more highly prepared to receive instruction yourselves and to convey it successfully to others.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JANUARY, 1834.

With Remarks and Exemplifications, by the Editor.

1. For a *Plough Plane;* Israel White, city of Philadelphia, January 9.

In the specification of this patent considerable space is taken up by the description of the plough used by cabinet makers and joiners, as it is usually made; however, as no one will feel interested in the improvement who is not acquainted with the instrument in its present form, we omit this description altogether. For many years past it has been the practice to regulate the distance of the fence from the plough iron by means of two arms having screws and nuts on them; previously to this, the arms were made smooth, and fitted nicely into holes made in the block of the plough, where they were tightened by wedges; the plough now patented may be considered as a modification of these two modes. It has three arms, the middle one of which has a screw and nut, whilst the two outer are cylindrical, and slide easily through two holes in the block. The intention of this is, to preserve the parallelism of the fence to the plate of the plough, without the trouble of setting both ends by the rule. The stop, or slide, which regulates the depth of the groove, is formed in the usual manner, but a mortise, or slot, is made through the side of the plough on to the brass part of the slide, which has graduations upon it that indicate the depth to which it is set.

Fillister's, and other planes, having similar moving parts, are to be made in the same way. The labour of making planes upon this plan is but little increased, and it manifestly facilitates the setting of them to the gauge required.

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2. For an improved mode of *Handling Hides in the Tan Vat;* Samuel Stem, and Daniel Wireman, Mechanic's Town, Frederick county, Maryland, January 9.

A frame is made of nearly the length and width of the vat into which it is to go, and capable of being readily raised or lowered. Along each end of the frame, on its upper side, pins are placed, at regular distances from each other, for the purpose of suspending the leather which is to be tanned. This frame has a piece of timber

crossing from side to side, at the middle part of it, to receive the action of the lever by which the handling is to be effected. The fulcrum of this lever is an axle, or shaft, extending across the vat, and having a wheel at each end to facilitate the moving of it, which wheels rest on cap timbers, or ways, on each side of the vat. The short end of the lever is attached by a jointed rod to the cross timbers on the frame, and when the long end is pressed upon, the frame will be raised. By making the frame somewhat shorter, or narrower, than the vat, a longitudinal, or lateral, motion may be given to it; or, if desired, it may be readily so contrived as to cause it to vibrate, or rock.

The claim is to the handling of hides by the apparatus, or combination of machinery, above described.

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3. For *Substituting common Grindstones for the Rubbers in Smut and Hulling Machines;* Bartholomew Smith, Bethlehem, Albany county, New York, January 9.

It is not proposed to confine the use of grindstones to machinery of any particular form, but to adapt them to such as is well known, and of various constructions. These stones, it is said, possess many advantages over the cast iron, and other rubbers and hullers. Among them are, their not being subject to glaze, their operating more perfectly, their capacity of being used at a greater distance from each other, and thus preserving the grain unbroken, their cheapness and their durability.

There is another point of much importance to the patentee, and that is, the novelty of the invention, or application. We do not know that common grindstones have been named in any of the patents previously obtained, but we do know that sand stones, or stones having a sharp grit, have been spoken of as employed for such purposes, and this, at all events, is touching the grindstone very closely. Common mill stones, and those with a mill stone grit, have also been extensively used, and this, too, is very much like using grindstones.

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4. For *India Rubber Hose for Fire Engines, &c.;* Edwin M. Chaffee, Roxbury, Norfolk county, Massachusetts, January 9.

Linen or cotton duck is to be coated on both sides with a solution of caoutchouc, and suffered to become nearly dry. It is then laid upon a table, and folded over so as to form a tube, or hose, of the required diameter; the folding, or rolling, being continued so far only as shall cause the cloth to be double for about half the circumference of the hose. Each end of it is then to be completely stopped with a block of wood, one of the blocks being perforated, so that by means of a condensing, or force, pump, air, or water, may be forced into, and made to distend the tube; when this has been done, the rolling is to be continued until three, four, or any required number of thicknesses of the prepared cloth have been united together. The surface is to be moistened with a solution of the India rubber, and care taken that the juncture is perfect in every part, all air, &c. being carefully excluded.

The "claim is to the use of air, water, or other fluid, for the above

purpose, and to the hose that shall be constructed in the mode above described."

We do not think it quite correct to claim the mode of manufacturing, and also the article manufactured, provided the latter does not differ from such as is made by other methods. If the article itself is a new manufacture, it is patentable; but if I invent a new machine for cutting nails, which nails are not distinguishable from those made by other machines, I should think it at least superfluous to claim both the machine, and the nails cut by it. This claim, it is true, may be mere surplusage, and so we think it, in which case it will not vitiate the patent; but in obtaining a monopoly, it is best to be careful to leave as little as possible for the gentlemen of the long robe to talk about; every claim made, which is not clear, distinct, and characteristic, tends to embarrassment, and is, therefore, best avoided.

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5. For a *Riddle, or Rotator, for separating Ashes from Coal;* John J. Glen, city of Philadelphia, January 9.

The Rotator is represented as composing a circle of grate bars, united together by a hoop, or ring. The grate, however, is divided into two parts, by bars which cross, and unite the other bars, about the middle of the circle. The object of this is to hang one half the grate upon pivots, so that when a pin which supports it is withdrawn, the half so hung will fall, and discharge the coals into the ash pit. The whole circle is supported by having a conical cavity on its under side, resting upon a projecting pin, thus allowing a vibrating, rotary motion to be given to the whole, by means of a projecting handle. The centre cap makes a part of the unhinged half of the grate. The rotary movement constitutes the claim.

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6. For a *Weathercock Wheel,* to carry every kind of machinery by wind, or water. Nathan T. Davis, Wilmington, Windham county, Vermont, January 9.

This machine is intended to be one of no ordinary character, as it is "to carry any and every kind of machinery by wind or water; also to propel boats and every other kind of water craft by wind," an article much cheaper than wood or coal, whilst the apparatus through which it is to operate will also be much less costly than a steam engine.

The weathercock wheel, when acted on by wind, (as weathercocks usually are,) is, in fact, a vertical wind mill, having four sails, which are quadrangular, and turn upon gudgeons in suitable arms; the gudgeons not being placed in the middle of the upper and lower edges of the sails, but nearer to one end than to the other, that the wind may always direct them in one way. There is a stop, or button, upon the arms, to hold the sail when under the action of the wind, and there are ropes leading from their ends to the vertical shaft, to govern their motion.

In what particular all this differs from many other vertical wind mills, we do not know, and are not likely to learn.

A wheel made in the same way is to be placed in the tide, or cur-

rent, of a river, where it will run as well, and do as much work as many similar wheels have done before it; and why it should do more we know not, as it is exactly like them. In several instances they have certainly answered as well as we have led the proposers of them to anticipate, but still, this has been so badly, that they have been all thrown by as useless. The patentee, no doubt, prophecies more favourably of the one before us, or rather, did so in January last; if, however, he has been working, or labouring, with it ever since, he has encountered unexpected difficulties, which will not be easily overcome, as they are inherent, and therefore, like chronic complaints, very obstinate in their character.

This wheel, however, is destined, or rather designed to perform a more noble office than that of a mere wind and water wheel: it is to propel boats, and thus take the place of the steam engine. The said vertical wind wheel is to be placed within the boat, and geared to the paddle wheels; when, should every thing operate as intended, the boat will be thereby propelled. Even here, unfortunately, if a worthless contrivance can be called unfortunate, the invention is not new; it has been proposed hundreds of times, and even patented more than once. Those who cannot perceive the utter futility of such a plan, have more to learn than we can attempt to teach them.

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7. For *Preventing the waste of Heat in Cook Stoves; applicable to other purposes;* Eliphalet Nott, Schenectady, New York, January 9.

(See specifications.)

8, For a *Machine for Grinding Corn;* Thomas Briggs, Bloomfield, Ontario county, New York, January 10.

Here we have an iron cylinder, which may be one foot in diameter, and four inches in length, along which teeth are to be formed, or cutting knives placed, extending from end to end. An iron, or a steel, concave, furnished also with teeth, is placed so that its lower edge shall be nearly in contact with the cylinder, and the corn to be ground, being placed in a hopper above, passes down between the cylinder and concave, and, as the cylinder is made to revolve, is acted upon by the teeth, or knives. There is, of course, to be a suitable frame, properly enclosed, and the necessary provision for turning the cylinder.

Such a machine, we should suppose, might serve to make hominy, by breaking the corn, but so far as grinding is concerned it is rather an unpromising affair. The patentee has not pointed out its merits, or preferred any claim.

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9. For *A Vice;* James Long, Harrison county, Virginia, January 10.

This is a wooden vice, denominated by the patentee the "Superior Vice," and since there is no standard given by which to judge, and there are undoubtedly some which are inferior to it, the name

need not be objected to. It is to be tightened by a wedge, and is to be used by wheelwrights, coach-makers, joiners, &c., instead of that usually tightened by a screw. Like other wooden vices, it has two upright jaws, one of which is to be made fast to the bench, whilst the other works upon a joint at its lower end; this, which is the front jaw, has a mortise through it at the part usually appropriated to the screw; and a long tenon, which is firmly attached to the back jaw, passes loosely through this mortise, and receives wedges which tighten the jaw, or cheek.

When the wedge is to be removed the jaw is opened by placing the foot upon a treadle at its lower end, which, when pressed down, bears against a friction roller in the back jaw. A spring is so fixed as to close it when the foot is taken off the treadle. We are told that by facing the inside of the jaws with steel, this will be found to be a very cheap and useful vice for a blacksmith; there are, however, but few blacksmiths, we believe, who would be willing to use it, if they could procure one of iron.

The patentee sets forth the good qualities of his invention very much at large, but as its construction will be easily understood, we leave it to tell its own tale.

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10. For an improvement in the *Surveyor's Compass;* William J. Young, city of Philadelphia. First patented January 17, 1832. Patent surrendered and reissued January 11.

The patentee states that in the former specification he was, by inadvertence, made to claim as a part of his improvement, "the principle of measuring horizontal angles without the aid of the magnetic needle; which it was never his intention to claim, the same having been known for several hundred years, as a constituent part of the Theodolite."

The invention was duly noticed in our remarks on the patent issued in January, 1832, to which we refer; the only difference in the specifications being the omission of the claim above noticed.

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11. For improvements in the *Machinery for Spinning Rope and Duck Twine.* Granted to James Long of Greenock, Scotland, agreeably to a special act passed July 3, 1832. Issued January 16.

(See specifications.)

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12. For a mode of *Preserving the Shingles used for covering houses;* Foster Henshaw, Brookfield, Worcester county, Massachusetts, January 16.

Tar is to be poured into a suitable kettle, and about one-fourth part of turpentine is to be added. The mixture is to be brought to a scalding heat, when the shingles are to be dipped into it, and the two sides then placed upon sand which has been sifted, and made hot, that the grains may sink the more perfectly into the tar.

How much of novelty there may be in this we cannot tell precise-

ly, but we know that the amount is not large; the dipping of shingles into heated tar, has been frequently practiced, and the covering them with hot sand, after they were laid on the roof, has also been done. We doubt the utility of adding the turpentine to the tar, the latter being itself composed in a great measure of this article.

The claim is to "the application of the foregoing composition to shingles, employed in covering buildings." This claim would certainly include the application after, as well as before, the laying of the shingles.

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13. For a machine for *Mortising Window Sash;* Orin Ellis, Orange, Franklin county, Massachusetts, January 16.

A very imperfect description is given of this machine, although by its aid, and that of the drawing, we can form a tolerable idea of its general construction. The strips to be mortised are placed upon a suitable bench, or table, from which rises, perpendicularly, a standard, that sustains the chisel, and the pieces which are to serve as sockets, or guides, for it to slide in. A lever is fixed in the manner of a treadle, near to the lower part of the table, and the chisel is forced up and down by its aid; a pitman, or sliding rod, extending from it for that purpose. The lever is raised by means of a spring, and forced down by any adequate power.

The chisel is to be made in four pieces, so bent at their lower ends that they shall, combinedly, form a socket of the size of the mortise to be made, the whole four sides of it being cut by them at once, whilst there is a punch, or clearer, so fixed as to force out the chips.

"What is claimed as an invention, is, the square chisel set in a stock, and having a punch, or clearer, operating within the same, for mortising window sashes." There are several patents for mortising with chisels in the form of a square socket, but we believe they are all in one solid piece. To form such a tool of four pieces, to cut so as not to admit chips in the joining angles, will be a thing of some difficulty.

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14. For a *Washing Machine;* William Miller, and Ezra Rogers, Connersville, Fayette county, Indiana, January 17.

A cylinder, having its periphery covered with flutes, or rounds, is to be placed in a trough, its gudgeons bearing against springs which allow it to rise. There is a hollow, or concave, in the lower side of the trough, furnished with rollers from end to end; between these and the main cylinder the clothes are to pass, by giving an alternate motion, backward and forward, to the latter.—We do not look for novelty in washing machines.

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15. For a *Cylindrical Flyer, and a Step for Spinning Machines;* Samuel P. Mason, Killingly, Windham county, Connecticut, January 17.

The flyer here patented consists of a cylindrical ferule, or barrel, of metal, sufficiently long and wide to admit the spool upon which

the spun material is to be wound. The upper end of this cylinder is open, and has pins, or notches, on its edge, to guide the thread; the lower end of it is closed, and has affixed to it, by soldering or otherwise, a hollow steel or iron spindle, which receives a whirl, and allows the main spindle, that supports the bobbin, to traverse up and down within it. The hollow spindle has, of course, a suitable step and collar, to support it as it revolves, with its cylindrical flyer.

The advantage proposed by the adoption of this spindle, is the getting rid of the resistance of the atmosphere, and the consequent accelerated motion which may be given to it. The only part considered new is the flyer, as described.

As regards the getting rid of the resistance of the atmosphere, we see but little difference between this and the can spinner patented by John Thorp, November 20th, 1828, (vol. iv. p. 65.) In the foregoing patent, the can is inverted, and is operated upon in a different, and perhaps in a better way, than in Thorp's machine, but still, in the point alluded to, they appear to be similar.

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16. For a *Clover and Rice Hulling Machine;* James W. Mathews, and Matthew S. Kahle, Lexington, Rockbridge county, Virginia, January 17.

Although this machine is the production of the combined talents of two inventors, they have not been so happy as to strike out any thing that is new; the cleaning, or hulling, being effected by their instrument in precisely the same way in which it has been done by many others. The grain, or seed, is to be subjected to the action of one or two cylinders with their concaves. When there are two cylinders, the upper one, made of wood, is to be surrounded by punched sheet iron, or covered with emery, wire, pins, &c., the concave being similarly coated, or covered: the seed is to fall from this to the second cylinder and concave, covered with shark skin, sole leather, powdered emery, sand, glass, or any other gritty substance, where it is again rubbed, and falling thence, is acted upon by a fan wheel of the usual construction.

The invention claimed consists in the peculiar construction of this machine, and in the arrangement and combination of its several parts.

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17. For an improvement in the *Art of Cutting Garments;* James H. Chappell, Chilicothe, Ross county, Ohio, January 18.

We are referred in the specification of this patent "*Spherical System,*" to a printed book, containing directions on each end of the cover; and which is also to be used for recording measures. Not having seen the printed book, and being, therefore, without even the ordinary guide of reviewers, the printed title, we are unable to report upon it; those who are adepts in this business, however, will, undoubtedly, obtain the work, and possess themselves of all desired information on the subject. Although the specification does not tell us what the system is, it furnishes some information respecting what

it is not. This system is not, like its predecessors, "based upon the divisions of the breast, waist, or height, of a person," "but has its base from whole measures taken from a point of the body at right angles in front and bottom, of arm hole, or scye; for further particulars see explanations for measuring and drafting coats," which we suppose forms a part of the subject of the said volume, or Sibyline leaves.

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18. For *Making Isinglass, or Icthyocolla;* William Norwood, John Burns, Jabez Rowe, and Josiah Haskell, Gloucester, Essex county, Massachusetts, January 21.

The whole specification of this invention, or discovery, does not greatly exceed in length the catalogue, or list of the names of the parties concerned in its elaboration. We are told to take the sounds of the fish, (cod fish, we suppose,) to clean them from all blood, and fleshy particles, dry them, soak them in fresh water, and then to pass them through a machine consisting of a roller, or of knives, to divide them into small pieces; then to mash them to a paste between iron rollers, continuing to roll it until it forms long ribbon-like strips, which are to be dryed. The claim is to the cutting the material into fine pieces, breaking it into paste, and running it into strips.

The sounds of cod, as well as those of several other kinds of fish, consist principally of gelatin, which is in its nature identical with the icthyocolla obtained from several species of sturgeon.

We do not perceive the advantage of treating the sounds in the way proposed by the patentees, as the nature of the article will not be altered by mechanically destroying its fibrous texture. The manipulation to which it is subjected must render it more costly than when merely cleaned and dried, and should it even give to it an improved appearance, this alone is not the kind of improvement for which the law contemplates the granting a monopoly; there ought also to be in the discovery, or invention, some real utility—something to benefit the public. How much each of the individuals concerned in taking out the patent, contributed towards this invention, or discovery, it might be difficult to tell, but to entitle them to it they must each be "true inventors or discoverors."

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19. For a *Machine for Tonguing, Grooving, and Planing Boards,* for flooring, and other purposes; John D. Bears, city of Philadelphia, January 18.

The planing, tonguing, and grooving, effected by this machine is, almost exclusively, done by circular saws; in most instances, the application of these is sufficiently plain, although the specification is not very clearly drawn up, and the drawing not well executed.

The planing is to be effected by a circular saw, having teeth on its rim, their edges being in the plane of the wheel, like the teeth upon a crown wheel. These teeth, when sharp, will, it is said, render the face of a board quite smooth; but, in addition to them, knives, or cut-

ters, are attached to the arms of the wheel, like those sometimes used in straw cutting machines, the edges of these knives being either straight or curved, and projecting a little beyond the teeth which are on the periphery. The board to be planed is passed between rollers, two of which have projecting teeth, or pins, to take hold of it, and cause it to advance. The planing wheel operates upon the under side of the board, so that the shavings fall down as fast as they are taken off.

The grooving and tonguing, is to be effected entirely by circular saws, some of which work vertically, and others horizontally, according to the purpose which they are intended to answer. The grooving may be effected by three circular saws, following each other, each of them rather more than one-third of the width of the groove in thickness, so that they may overlap each other, and cut the groove clean.

The patentee claims "the application of circular saws for tongueing, grooving, and trimming boards. The application of circular saws for reducing to a thickness, and planing boards for flooring and other purposes, also the application of planing, or shaving irons, in the mode, and for the purposes herein described. The application of wheels with points projecting beyond their peripheries, to move the board, or plank, through the machine."

At p. 120 of the last volume, there is described a machine for planing, tonguing, and grooving, patented on the 28th of August, 1833, in which the jointing, tonguing, and grooving, are all proposed to be effected in precisely the same way with that now claimed. On examining the remarks made upon that patent, it will be seen that we did not then deem the plan to be essentially new; in the other parts we think there is sufficient novelty.

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20. For an improvement on the machine invented by Daniel Toms for *Sawing Staves;* Jesse J. Smith, and John Rice, jr., Cayuga county, New York, January 21.

The machine upon which this claims to be an improvement, was patented by Mr. D. Toms, of Auburn, Cayuga county, New York, March 2, 1830, and is described at p. 361, vol. v. The present patentees describe the whole machine, which, in its essential features, remains unchanged; what they claim as invented by them consisting in variations in the manner of gearing, and regulating the action of it, as will be seen by the following quotation. "The lever-dogs, the cog, and rag, and spur wheels, with the slides for moving and holding the log on the head block; the combined levers, and the spring with its rod, and the angular piece which lifts the lever on the spring, all for the purpose of throwing the pinion in and out of gear with the carriage rack, we claim as altogether our own construction and invention."

It is to be presumed, that this patent is obtained with the concurrence of the original patentee, as, otherwise, the improvements, however valuable, will not enable the improvers to use the machine. As

regards the present claims, however, they are necessarily restricted to the particular mode of gearing described, and however good and convenient this may be, it is not to be supposed that there would be much difficulty in divising others equally so.

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21. For an improvement in the *Construction of Canals, and in certain machinery whereby boats may be propelled on the said canals, or on other waters, &c;* Charles Bonnycastle, University, Albemarle county, Virginia, January 21.

This improvement in canals relates entirely to the constructing within them an apparatus to be connected with some motive power, usually a steam engine, by which boats may be propelled thereon.

A rail, resembling Palmer's single rail for rail-roads, is to be constructed along the middle of the canal; it may be even with, or elevated to any convenient height above, the surface of the water. This rail is to be surmounted by one of iron, which is to be acted upon by the power employed to propel the boats. These boats are intended to be long and narrow, as they are to go two abreast, one on each side of the rail; a train of them is to be connected together, the two foremost of them carrying the steam engine, or other motor. Two wheels, which may be of the size usually employed upon rail-roads, are made to revolve horizontally against the opposite sides of the rail, embracing it between them, they, by a suitable contrivance, being made to press against it, so that by their friction the locomotion may be effected.

The boats on the opposite sides of the rail, are to be connected together by suitable straps which pass over it, and their stems and sterns are so constructed and adapted to each other, that whilst they are allowed to have play enough to turn round curves, they may operate, as nearly as possible, like one continuous boat.

The advantages anticipated from the foregoing construction are the following.

1st. The application of steam, or other power, for propelling boats upon canals, or other waters, where it is not now employed, because the action of paddle wheels would be destructive to the banks.

2nd. The keeping in a certain line, by means of the rail, admitting of a great increase in the length of the chain, or train, of boats; their width and depth being diminished in proportion, whereby the resistance, and the consequent washing of the canal, are greatly decreased.

3d. The using of short boats, whereby a long chain of them will be enabled to turn on such curves as are common on canals; and also to allow them to pass over inclined planes.

In passing over inclined planes, wheels, with trucks, such as are now employed, or others which may be found convenient, are to be used, locomotive or fixed engines being employed. The claim is in the following words:—

"What I claim as my invention, and for which I solicit letters patent, is the use of one or more rail-ways elevated above the sur-

faces of canals, rivers, lakes, or other waters, or placed at small distances below those surfaces; the word surface herein designating the surface of the water. Also, the use of such method of connecting boats as that herein described. And, also, the use of a motor, having wheels clasping a rail, and detached from the locomotive engine. And I do especially claim to myself the right of using this motion for propelling boats, barges, or other vessels, along canals, rivers, lakes, or other waters. I claim, and do reserve to myself, the right to use a locomotive engine, traversing on one or more rails raised above the water, or placed at small distances below it; such engine being propelled, if necessary, by the adhesion of its own wheels."

Various contrivances have been made for applying the motive power on board of steam-boats otherwise than by paddle wheels; as, for example, by a chain, or rope, along the canal; by wheels acting upon the bottom, or upon the tow path, and by logs lying along the middle, having racks upon them, into which a toothed wheel might work; the present plan we believe to be new, and the main, if not the only difficulty in the way of its adoption, is that the canal and boats must be constructed exclusively with a view to it.

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22. For an improvement on the *Mode of fixing Valves on the Boilers of Steam Engines;* David B. Lee, city of Philadelphia, January 23.

The safety valve here patented is, we are informed, "a fixture for boilers for steam engines, to prevent *collapsation*, resembling the common safety valve, except that it opens in by the pressure of the atmosphere." And "the part claimed as an invention, or discovery, is, not the particular form of the valve, but the general plan of fixing a valve, or valves, to boilers of steam engines, which shall open with an external pressure, to prevent collapsation."

A very little reading would have shown to the patentee the antiquity of his invention, as an account of it may be found in most, if not in all, of the numerous histories of the steam engine. We could take from our shelves a dozen books from which to quote upon this point, and could refer to numerous patents in which such valves are noticed. In the article Steam Engine, in Rees' Cyclopædia, after speaking of the safety valve in Watt's engine, it is observed, that "There is another valve of safety, for the reverse of the object of the first mentioned safety valve; it opens internally, and is balanced by a small lever, and a sufficient weight to keep it shut, until the pressure of steam within the boiler becomes much less than the external air, which then forces open the valve, and enters into the boiler till the equilibrium is restored. It is evident that this valve can never be necessary so long as the engine is at work; but its use is to prevent the sides of the boiler being crushed in by the weight of the air, when it has done work, and the steam within it cools and condenses."

This kind of valve, has, in fact, been applied to hundreds of boilers, stills, &c. With the kind of boilers which we now ordinarily use in steam engines, valves of this kind are not employed, for the

simple reason that they would be of no use. Our cylindrical iron boilers do not collapse by the pressure of the atmosphere, which they would be able to sustain even if perfectly exhausted; nor is the collapsing which frequently takes place, a collapse of the boiler, as the patentee appears to suppose, but of that of the flue which passes through it, and which is forced in, not by the pressure of the atmosphere, but by that of high steam, occasioned, in general, by the water being allowed to descend too low, which admits of the heating of the upper part of the flue, and the consequent diminution of its strength; it then yields readily to a pressure which, under ordinary circumstances, it would have sustained most effectually.

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23. For an *Apple Grinder and Corn Sheller;* Moses Morehead, Butler county, Ohio, January 23.

This apple grinder and corn sheller is made very much in the form of the ordinary cast-iron bark mill, but the shell, or tub, and the nut also, are made of wood, having on the inside of the former, and the outside of the latter, strips, or bars, of wrought iron. And the improvement is said to consist in "the iron bars which are screwed to the tub, and cylinder, and in the application of the machine to grinding apples and shelling Indian corn."

This machine will not, we are well convinced, accomplish either of the purposes to which it is intended to be applied, nearly as well as the ordinary machines now in use. The shelling of corn should be effected without the breaking of the cob, and a machine which will allow the latter to pass through will not reduce apples to the state of pommage.

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24. For an improved *Hat Block, for colouring and cooling Hats;* Richard Pike, Wilton, Fairfield county, Connecticut, January 23.

The hat block here patented instead of being made out of solid stuff, in the usual way, is to be formed by framing wood together so that a large portion of the surface of the block shall be open, and admit the air and colouring matter freely to the inside. The surface of the block may, if desired, be covered with thin wood or metal, which is then to be perforated with numerous small holes. By this arrangement the colouring and cooling are both facilitated, are better performed, and at less expense than by the old mode. The claims are to "the open framed cylinder block, and the perforated covering thereon."

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25. For a *Machine for Cutting Sausage Meat*; Daniel S. Middlekauff, Hagerstown, Washington county, Maryland, January 23.

The meat is to be placed upon a circular plank, or block, which is to be made to revolve slowly by the turning of a winch, which at the same time gives motion to a horizontal shaft having cams, or lifters, upon it, that raise a row of wooden springs, to each of which is attach-

ed a knife, or chopper. The claim made is to "the particular arrangement of the several parts of the machine before described, for cutting sausage meat." To what particulars this claim refers, we are unable to say, unless the intention is the exact form and manner of constructing the parts, as we perceive nothing in the principle or operation of the machine which has the slightest claim to novelty.

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26. For a *Machine for Cutting Sausage Meat;* Jacob Fahrney, Quincy, Franklin county, Pennsylvania, January 23.

A semicircular, concave trough is to be made of wood, and within this is to be fixed a row of knives, placed near to each other. A cylinder of wood, carrying knives which pass between those fixed in the concave is to revolve by means of a crank. A trough, or hopper, to receive the meat to be cut, surmounts this apparatus, and a comb placed on the ascending side of the revolving knives, or wings, serves to clean them, and to prevent the meat from being carried round by them.

The apparatus is but very indifferently represented in the drawing; the claim is to the wings stationed in the cylinder; the improvement of the cuts in the wings by which the meat is pushed through the knives; and the comb, with its operation of cleaning the wings, with the additional knife on it. The defectiveness of the drawing prevents our ascertaining what is intended by a part of these claims, although the general operation of the machine is sufficiently obvious.

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27. For a *Hook by which the Bits may be attached to Bridles, and other parts of Harness be connected together;* Asahel A. Hotchkins, and Ebenezer Garnsey, Sharon, Litchfield county, Connecticut, January 23.

This contrivance is designed to connect the several parts of the harness without the use of buckles, or such other fastenings as are now employed for that purpose. A piece of wire is to be bent in the form shown by the sketch in the margin; one end of this is to be attached to the reins, or harness, and the other, or hook end to the bit, or other part. The two ends of the wire thus bent forming a hook, and a spring, to prevent the slipping out of the bit, &c. The advantages are said to be cheapness, and perfect security; and the claim is to a fastening thus made of one piece of metal, instead of two or more pieces.

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28. For a *Lever Power, by which both power and velocity are gained;* Tyler W. Lafetra, city of New York, January 23.

Upon reading the title of this patent we came at once to the conclusion, that, whatever might be the form of the apparatus, it would, should its construction and application be prosecuted with zeal by the patentee, possess the power of exhausting his purse with considerable velocity, and in this way more than justify his anticipations. When

a man, ignorant of the first principles of mechanics, has turned a well-hung grindstone with considerable velocity, he is very apt to conclude that he has discovered a power hitherto unappreciated; and such is the discovery now before us, excepting that instead of the two simple gudgeons of the grindstone, there are to be at least thirty rubbing parts, each of which is to assist in the gaining of power.

Most of our readers, we suppose, know what is intended by "lazy tongs," which consist of a number of ×, or scissor-formed joints, connected together; it is by the application of an apparatus of this description that power and velocity are to be gained. A heavy fly wheel is to be suspended upon gudgeons, and is to have a pinion upon its axis; a cog wheel is to gear into this pinion, having a crank upon its shaft, which is to be driven by a shackle bar, or pitman; an alternating motion is to be given to the pitman by working a lever, like a pump handle. The merit of the contrivance resides in the pitman, which is constructed with joints in the manner of the lazy tongs; the lever, however, ought not to be worked by a lazy man, or he will expend his labour, and have but little to show for it. It is true that in this opinion we differ very much from the patentee, who contemplates the applying of his "contracting and expanding pitman at the end of a lever beam of a steam engine, to rail-road cars or carriages, operated upon by steam, and, in fine, to all machinery wherever lever power can be employed." Perhaps, however, there may be a more perfect agreement between us now than there would have been at the time of obtaining the patent, six months ago; that this is the case, we have not the slightest doubt, provided he has fairly tried the experiment of putting his contrivance into practical operation.

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29. For improvements in the *Construction of Wagons and other Wheeled Vehicles;* Elijah Brown, Stockbridge, Berkshire county, Massachusetts, January 23.

There are several things claimed as improvements in this patent, some of which are certainly not new, however useful they may be. The axle which enters the wheel is not to be regularly tapered, but is to be cylindrical for three or more inches towards the shoulder, and is also to be cylindrical, but of a lesser diameter, towards the lynch-pin. The box within the hub is to be in contact with it at the cylindrical parts only. The wheels are to revolve perpendicularly, the axle not being bent, as for dished wheels.

A metallic rod is to be inserted along the centre of the wooden axle, and secured in it by a key at the back end, the front being tapped to receive a nut.

Metallic cylinders, with wings to secure them, are to be driven on to the wooden axle, to form the cylindrical bearings.

The arms of the crotch are to be widened out, so as to be inserted into the hind axles as near as may be to the wheels, and it is to terminate in front as near as possible to the fore axle omitting the common reach.

The tongue is to extend through the hounds so that its end may

come into contact with the fore axle, where it is to be allowed to work up and down between metallic plates.

Tube plates (metal tubes, we suppose,) are to be inserted in all parts liable to be worn by a pin.—All these things are claimed.

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30. For an improvement in *Hanging Bells;* Joseph Carrier, city of Boston, January 23.

At p. 403 of the last volume, we gave an account of a patent for hanging house bells, obtained by a citizen of Boston on the 26th of December last; between that and the present plan there is a considerable degree of resemblance, although they are not by any means identical. The hemispherical clock bell, which made a part of the claim in the former patent, is the kind used in the present instance. It is to be furnished with two hammers, striking it on opposite sides, and the tails of these are to be tripped by the cams projecting from a slide, which is acted upon by the bell wire, and a spiral spring. The same bell is to serve for a number of apartments, their wires being all connected to a kind of lever which acts upon the slide with its cams, and each wire having suspended from it, a number, or token, which shows, by its vibration, the wire which has been pulled. The specification is written with much clearness, and with the aid of the drawing presents the apparatus patented very distinctly before us. The claim is to "the construction, combination, and adjustment of the said machinery, for producing the desired effect."

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31. For *Preparing and Leaching Ashes, and making Potash;* Ephraim Parce, Chenango county, New York. Patented July 20, 1831. Patent surrendered and reissued upon an amended specification, January 23.

In vol. ix. p. 48, we gave an abstract of the original specification, and as the new one differs much from it in its form, we shall proceed with that in the same way.

The improved mode of making potash is said to consist of two parts. First, in applying lime and salt dissolved in water, at a boiling heat, to crude ashes. These agents, it is stated, have both been previously employed, but not at a boiling heat, and it is in this that the improvement in part consists. The mixture may be made in different ways, but the mode preferred is the combining the lime and salt in proper proportions, dissolving and pouring them on the ashes at a boiling heat. Fifteen pounds of salt, one bushel of lime, and eighty gallons of water may be used with twenty bushels of common house ashes; but these proportions admit of considerable variation.

The ashes being thus prepared the second part of the process commences; this consists in the pouring cold water upon the ashes thus prepared, which will leach them more effectually than has been heretofore done.

The directions given for carrying the process into effect, are as follows:—

With twenty bushels of ashes, prepare the leaches with lime bot-

toms in the usual way; bring the salt and water to nearly a boiling heat, and then add to it the bushel of unslaked lime, which will immediately cause it to boil. Upon the first layer of ashes, which may be four inches deep, pour as much of the heated mixture as will thoroughly scald it; go on thus with fresh proportions until the whole of the ashes are thus scalded. With field ashes the salt is to be reduced one-half, and the lime increased one-fourth. The ashes are to be covered with cold water until it rise two inches above them, and kept so covered until they are exhausted, which will require eight or ten hours. The boiling and melting are then to be proceeded in.

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32. For *Making Scythes*; Abel Symonds, Fitchburg, Worcester county, Massachusetts, January 23.

The scythes are to be of the kind called "the concave set scythe, and the thing patented is the mode of giving the concavity to the web of the scythe. The description is very imperfect, but the apparatus appears to consist of a pair of swages, or *faces*, one of them concave, and the other convex. The concave face is to be fixed in an anvil stock, and the convex face in a trip hammer. The parts claimed are the above faces only.

We know not in what way the concavity is usually given to such scythes, but so many articles are formed by means analogous to that described; we should not think, therefore, that the application proposed was a patentable affair.

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33. For an improvement in *Tanning;* Walter Russell, Ashburnham, Worcester county, Massachusetts, January 23.

The skins are to be raised one-fourth more in the lime than they would bear in the common drench, and they are then to be rinced clean and fleshed; after this, immerse them in warm water, and, on taking them from this, work them carefully on both sides with a fleshing knife; they are then prepared for the following liquor.

Into about thirty gallons of water put as much salt as it will dissolve; add two pounds of sulphuric acid, stirring it well. This will suffice for fifty sheep skins; immerse twenty-five of these at a time in the liquor, allowing them to remain therein about an hour; then take them out, let them drain, and immerse them, one at a time, in water as hot as the hand will bear, rincing and withdrawing them quickly; the liquor is then to be squeezed out on a table by means of a *slicker*. Having prepared a sufficient number of skins in this way, immerce them for an hour in sumack liquor, of the usual strength;—squeeze out the liquor on a table, as before, put them into the liquor again, and the tanning will be completed in a few hours. If bark liquor is used, a small quantity of salt is to be added to it.

A note bene is added, informing us that skins so tanned save one-fourth in the process, and bring twelve per cent. more in the market than others.

34. For an improvement in *Stoves*; John G. Treadwell, Albany, New York, January 23.

There are said to be two improvements in the stove included in this patent; the first of them consists in making the bottom of the oven of two plates, placing them at such distance apart as may be found convenient, and allowing the heated air in its passage to the flue, to pass between them. This, we are told, will equalize the heat, and preserve the bottom of the oven from a rapid decay. The second improvement consists in the substituting of two cast iron rotary dampers for the sliding dampers now in use. These rotary dampers are to have a cast iron handle, but in what they differ from other rotary dampers we are not told, the thing being spoken of as though rotary dampers were entirely new to the world; whilst they are so common, that if they were unknown to the patentee, one might be ready to suppose that he had lived out of it. We have sometimes seen stoves with two ovens, one above the other, the fire circulating round them; in this case there was necessarily a double bottom to the upper oven, the top plate of the lower oven forming one of them.

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35. For an improvement in the art of *Manufacturing Pumps*; Dudley L. Farnham, city of Philadelphia, January 24.

The water pumps to which the improvement now patented applies are two, first, Rountree's, which is applied to a fire engine, and is described in many works on mechanical science; the specification refers to that in the American edition of Nicholson's mechanics, vol. ii. p. 282. The second is a very similar pump patented by John F. Rodgers, of Waterford, New York, in February, 1833.

In the ordinary way of making these pumps, there is much nice work to be performed, and the present patent is taken for the construction of moulds in which the chambers, and other parts, are to be cast, so as to obviate the necessity of turning, or any other operation to insure their truth. They are to be cast of an alloy of three parts of zinc, and one of block tin, or of some similar compound, in moulds of iron or brass, requiring only the removal of the sprue from the cast segments, and the cleaning and soldering of the edges where they are to be joined. When the moulds are of brass, they must be heated before casting in them, and rubbed with sulphur, keeping them hot enough to burn the sulphur off. If of iron, the outside pieces must be smoked; and where a core piece, or plug, is used, it must be rubbed with soap once in every three or four castings; these cores also require to be driven out as soon as the metal is set, or it will crack by contracting upon them. We mention these points, which are noticed in the specification, not because they are unknown to the adept, but because they may be useful to those to whom they are new.

Drawings are given of the mode of constructing the several moulds, and a claim is made to the "plan of manufacturing pumps as applied to the two kinds described in this specification, by casting them in parts in models [moulds] perfectly finished, and so formed that the

different parts may be easily put together by soldering and bolts; thereby greatly lessening the expense of manufacturing."

A long description is given of the construction of the pumps, which, as they make no part of the patent, is mere surplusage; the moulds are very well represented in the drawings; but such moulds, for various purposes, are so well known, that it seems doubtful whether they are proper subjects for a patent.

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36. For a *Water Table* for outer doors; John Burt, jr., Tiverton, Newport county, Rhode Island, January 24.

Many plans have been devised for water tables, and for causing doors to close at the bottom, and to open readily over carpets, but few, if any of them, however, have continued in use. So far as we can judge of the plan now proposed, it does not offer any thing superior to what was before known. The description, however, is far from clear, even with the aid of the drawing, and we should probably fail in any attempt to make it so.

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37. For an improvement in the mode of *Dressing Woollen Cloth*, and cloth part wool and part cotton; Calvin W. Cook, Lowell, in the county of Middlesex, Massachusetts. Patented May 20, 1833. Patent surrendered and reissued on an amended specification, January 25.

In our list of patents, vol. xii. p. 320, we observed that the patentee was making trial of his machine, with a view to render its operation more perfect; in doing this it appears that he discovered his specification to be in some points defective, and that he has, in consequence, put in a new one, more clear and full than the former, although the machine is essentially the same, and the claims made in nearly the same terms.

Two hollow cylinders of copper, of about six inches in diameter, and of such length as may be requisite, are to be placed in a frame in which they may be situated like the ordinary wooden rollers of a gig mill, serving to wind the cloth on, from one to the other; one of the gudgeons of each of these cylinders is to be hollow, to admit steam, and their surfaces are to be perforated with holes of about one-eighth of an inch in diameter, and an inch apart. Before winding the woollen cloth upon these cylinders, they are to be covered by a number of yards of linen or cotton cloth, to prevent the too direct action of the steam, and to distribute it more perfectly as it comes into contact with the woollen fabric. The cloth to be dressed is attached by its two ends to the cotton, or linen, on the rollers, and is to be acted upon by teazles, or otherwise, to lay the nap correctly; and when this has been done the steam is to be admitted into the cylinder upon which the cloth was last wound, so as to pervade it entirely, the cylinders, in the mean time, being kept in motion. The steam may be allowed to act for about twenty minutes, when the operation of gigging may be repeated, and the steam afterwards applied in the steam cylinder for the same length of time. One cylinder, it is observed, may be

made to answer the purpose, although not so perfectly as two, and other modifications of the process are mentioned as being included in the general principle.

The machinery, in the form most approved for performing the operation, is described in the specification, and clearly represented in the drawing; but as the patent is not taken for this particular mode of construction, and as there cannot be any difficulty whatever in understanding the nature of it from what has been already said, we shall do no more than subjoin the claim.

"What I claim as new, and as my invention, is the application and use of such hollow perforated metallic cylinders as aforesaid, in the ways and manner used for the purposes aforesaid, and the applying of steam through such hollow perforated metallic cylinders, or cylinder, so to be constructed as aforesaid, to suit cloth as aforesaid, in the ways and manner, and for the purposes aforesaid."

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38. For various improvements in, and modifications of, the *Instruments for applying the Galvanic Influence to the Cure of certain Diseases*, for which a patent was obtained, July 22, 1833; Daniel Harrington, city of Philadelphia, January 27.

(See notice of this, among the specifications.)

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39. For a *Machine for Smooth Planing and Planing Mouldings;* Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

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40. For a *Machine for Sawing Tenons in Wood-work;* Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

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41. For *Machinery for Mortising in Wood;* Charles Thompson, Poughkeepsie, Dutchess county, New York, January 29.

These three several patents are obtained for machinery first patented December 6, 1830, and afterwards on an amended specification December 6, 1832. It has been since deemed advisable to surrender this last patent, and to take new ones for the separate parts of the machinery. Our notice of the patent of December 1832, will be found in vol. xi. p. 376.

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42. For *Machinery for making Window Sash;* Joseph Ingham, Wyalusing, Bradford county, Pennsylvania, January 29.

The machinery here patented is to be applied to the same purpose to which that named in the three preceding was specially adapted; there, however, is little or no similarity between them in point of construction. That which is the subject of the patent before us is said to consist of seven parts, intended to be applied to as many distinct operations, but all concurring in the accomplishment of one object, the manufacture of window sash. This apparatus, in most of its parts,

however, is so similar to what has been frequently used by carpenters and cabinet makers, so as to render it doubtful whether it or either of its parts, can be made the subject of a valid patent. The first machine, for example, is a kind of trough in which the stuff to be planed is laid, and there operated upon by hand, in the usual way, the trough serving the purpose of gauging it to a width and thickness. Another is a box, made like a mitre box, with saw kerfs across it at proper distances for cutting lengths, and tenons. Another is a machine for preparing the pins, which consists of a steel bed, having a hole through it of the size of a pin, and sharp edges, so that in driving the splits through, the pin is formed. Such machines we have known for forty years, and have no doubt that they were then antiquities.

The claim made is to "the particular construction of the above described manufacture, together with the combined application of its several parts to the purpose of manufacturing window sash." Which claim we could not improve, as we know not how to make that new which is old.

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43. For a *Machine for Hulling Clover Seed;* Elias Horn, Arock's Gap, Rockingham county, Virginia, January 30.

This machine is made like the ordinary cylinder thrashing machine, consisting of a cylinder revolving in a concave bed. The cylinder and concave may both be made of wood, covered with sheet iron, and having pins driven into them in such a way that they will pass each other. The claim is to "the before described machine, with the arrangement of the several parts," which several parts consist of what we have already noticed, with an inclined plane, or hopper, for feeding.

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44. For a *Water Wheel;* Elisha Bushnell, Sodus, Wayne county, New York; an alien who has resided two years in the United States, January 30.

This wheel is to be placed at the bottom of a flume, through which rises a vertical shaft to drive the machinery. The wheel may be from four to six feet in diameter, and from four to six inches in thickness; the buckets are placed spirally round its circumference, appearing like the segment of a many threaded screw, the water entering at top, and escaping at bottom. The cylinder which forms the penstock is to surround the buckets so closely as just to allow them to revolve, or it may be attached to and revolve with them.

There is no claim made, and no room for one, as water wheels upon this principle have not the slightest claim to novelty; and, as regards their utility, they may be considered as upon a par with the tub wheel.

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45. For an improvement in the *Still*; Jacob Weitzel, city of Lancaster, Pennsylvania, January 30.

The improvement claimed consists in an additional tub, called the doubling tub, which is placed in part above the still, and has the doubler within it. The beer is to be pumped up into the first, or

highest tub, through a worm in which the doublings pass, when it becomes somewhat heated; it may thence be let into the doubling tub, where it may be made to boil, preparatory to its being conveyed into the still through a tube fixed for that purpose. The opening of this tube is stopped by a plug sufficiently long to reach to the top of the tub, so that it may be readily drawn and replaced. *A plug so fixed, is claimed by the patentee*, when used to let beer from one vessel to another.

The singlings pass from the still into the doubler through a long crooked neck; and from the doubler into the worm in the first beer tub, through a similar neck, and thence into the cooler worm. To prevent the loss of spirit, should the beer boil in the doubling tub, a tube ascends from the cover of it into the beer tub, where the vapour is condensed. Besides the foregoing parts, a vent cock is employed for the escape of air from the still; and some other unimportant appendages are mentioned, but the foregoing comprehends every thing which is essential in the description.

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46. For an improvement in the *Rolling Mill*; William V. Many, city of Albany, New York, January 30.

This is denominated an "improvement in the common plain grooved and fluted plating and adjusting rollers," which are intended for the rolling of any metallic substance in a bevelled, or wedge form, and is particularly adapted to the rolling of carriage springs, as well as for tools of various kinds, and many other articles. The patentee makes claims of a most comprehensive character, including many things of which, if he has really invented them, he is by no means the first inventor; we doubt, in fact, the originality of any thing which he has here claimed.

Rollers, made either in single pieces, or in separate parts, are to be mounted in a frame, in the way flatting or rolling mills are usually mounted; one of these rollers is to have depressions or grooves in it of such eccentricity and form as the nature of the article to be rolled may require. Sometimes he proposes to use the common cylindrical rollers, and to prepare a slab of metal of such form and varying thickness as shall cause the metal to be rolled to receive its proper form by being placed upon it, and passed between the rollers with it.

It is also contemplated to use a single cylindrical roller, with a movable bed under it, to be advanced by the turning of the roller, the bed being so inclined, or otherwise formed, as to produce the intended effect.

"The said William V. Many further claims as his invention, the application of all rotary, lateral, horizontal and perpendicular motions of machinery constructed, or that may be constructed, whereby the operation or effect of which said machinery is to roll or plate metallic tools, articles or machinery, trade or commerce, with one or more sides or edges in the form of an inclined plane, wedge or bevel, or in which the sides or edges are not equilateral; and in the same operations to stamp or impress on any and every such article, any and every device, design, or engraving, or milling, matting, or beading,

which may or shall be required for use or ornament, to or upon the article manufactured."

Without inquiring what has been done on the other side of the Atlantic, we could point to various patents issued here, for the application of rollers to numerous purposes, embraced within the scope of the foregoing claims. We will refer to our remarks upon two only, one for rolling steel for carriage springs, issued in July, 1830, p. 300, vol. 6, the other for rolling iron and other metal, p. 36 of this volume. It will be found that we have in both these instances treated the general principle as one which had been long since carried into operation. Even the modification which admits of the use of an inclined plane has been specifically claimed in a former patent; and as to the formation of beads and other ornaments by means of rollers, we have known it from boyhood, and that is some time ago. There are in use several machines for rolling axes and other tools, and eccentric rollers for plane irons specifically. We have had occasion more than once to advise persons who proposed to take patents for the same thing, that they had been forestalled.

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47. For a *Water Wheel*, called a "collective power water wheel;" Isaac Harrison, Middletown, Frederick county, Virginia, January 31.

In high falls, where it is desirable to use all the power of the water, two or more overshot wheels have sometimes been placed one above the other, to receive the water in succession. This is done in those cases only where a single wheel could not conveniently be made of sufficient diameter.

We have in the course of our animadversions, had occasion, formerly, to advert to this plan, and here we have it brought before us again under the form of a new patent, in which the patentee tells us that "the invention here claimed consists in the use of two or more water wheels placed above each other; the water of the one being thrown upon the one below, and the power collected for driving mills and machinery, as before described."

We have been acquainted with this application of water for at least forty years, and in our recollection upon such subjects, extended much farther back, we have no doubt that we might add a corresponding number to the forty. Such combined wheels, it is true, are not in common use, and that for the simple reason that the situations in which they are applicable are rare; we presume, however, that there are but few countries where they may not be found.

Specifications of American Patents.

Notice of the specification of a patent for an improvement in the machinery for spinning Rope Yarn, and Duck Twine. Granted to James Lang, of Greenock, in the kingdom of Great Britain, in pursuance of an Act of Congress, passed July 30th, 1832, entitled "An act directing letters patent to be issued to Thomas Knowles, James Lang and William Steel, respectively." Issued January 16, 1834.

On turning to Vol. xi. p. 4, there will be found a notice of the above named Act, accompanied by some remarks. It will be seen that eighteen months had elapsed after the passing of the act, before the issuing of the patent, and as, by the terms of the law, the machinery must be put into actual operation within two years of its date, the time for doing so has now nearly elapsed. We have not heard what has been done upon this subject, but as it was the design of the agent of the inventor to import the machinery in its perfect state, and to set it up in Kentucky, this has probably been done, although the fact has not come to our knowledge.

The specification of Mr. Lang's machinery is accompanied by three large drawings, which are referred to throughout. To those persons, however, who are conversant with what has been done in the spinning of flax and hemp by machinery, a sufficiently clear idea of the proposed improvements may be communicated without the drawings; and to others, the subject, if more fully treated, would not be one of much interest.

The specification commences by observing that there are certain machines known by the name of Gill spreading or drawing heads, and Roving or spinning frames, which have been used by flax spinners, for spreading or drawing, roving or spinning flax, to produce yarn suitable for sail cloth, and other coarse linen fabrics; but that these machines have not hitherto been applied for producing coarse yarn suitable for making cables, ropes, or cordage; and that his improvement consists in the application of some parts of these known machines, in combination with other parts not heretofore used in such machines; the combination and arrangement of these old and new parts being such as to effect the drawing and spinning of flax, hemp, or other fibrous materials, into yarn fit for cables, ropes, or cordage.

The machine as first described appears to differ but little, if at all, from that known under the name of "the first spreading or drawing frame," having a feeding apron, or horizontal band of leather upon which the material to be spun is spread, and by which it is carried forward to feeding rollers, on leaving which it is acted upon by gills, or needles, fixed on to an endless chain, between the feeding and drawing rollers, which draw and deliver it in the form of a sliver, into a can in front of the machine.

As the different kinds of hemp and flax vary considerably in the length of their fibre, it is observed by the patentee, that, if the feed-

ing rollers were fixed at an invariable distance from the ends of the gills, the ends of the fibres would not always be caught properly by them, but would sometimes fall short of, and at others overlap them; and that to obviate this, the frame carrying these rollers is made capable of sliding, so that its distance may be varied in any required degree. When the hemp or flax is of a very short fibre, he sometimes uses two pair of feeding rollers. These rollers are also made capable of being elevated or depressed, as well as moved horizontally, so that the depth to which the gills shall enter may be regulated by the height at which the feeding takes place. The gearing is so arranged as to cause the surfaces of the drawing rollers to move with from 40 to 60 times the speed of those of the feeding rollers, according to the quality of the material.

After the sliver has been prepared in the first machine, it is passed through a second, nearly identical in its construction, but made considerably lighter, and double, so as to pass two slivers through separate feeding and drawing rollers, having also two sets of gills, or points. The speed, as before, must, necessarily, be adapted to the kind of work to be performed; separate cans are used to receive the slivers as delivered.

A third drawing machine is next to be used, which does not in any respect differ from the second, excepting in the proportionate speed given to the parts respectively, so as still further to elongate, or draw out the slivers.

The fourth and last machine employed is, in part, constructed like the former, but with the addition of the spindles and their appurtenances, as it is in this machine that the slivers receive their last drawing, and are to be spun into yarn. These slivers pass from the drawing rollers through funnel shaped tubes, within which are pieces of felt, intended to hold and smooth the surface of the yarn, as it is held and smoothed in leather or felt in spinning through the hand. The spindles, bobbins, and fliers are like those in ordinary use, but made stronger, and turned with more power, corresponding with the coarseness of the thread which is to be spun by them.

As in spinning coarse yarns it is necessary that there should be a considerable drag upon the spindles, springs, capable of being tightened, are made to press upon the peripheries of cylindrical barrels attached to them below the spools.

The patentee states, in conclusion, that "he has described many parts, in the machinery used by him, which are not new, but that his improvement consist, 1st. In the arrangement of the feeding rollers, as described, whereby the same are movable, so that their position relatively to the gills or needles, can be adjusted. 2nd. In the apparatus described for receiving the slivers from the drawing rollers of the roving frame, and which contain layers of felt or cloth through which the yarns are drawn by the fliers of the bobbin spindle. 3dly. In the method of applying friction readily, in order to produce such a resistance of the bobbins to be turned round as will cause the yarn to be taken up and wound properly in the bobbins. The said improvements are claimed when the same are applied in conjunction

with the other known parts; being so proportioned and arranged as to act properly with my improvements, and to form when combined with them, a series of machines for the purposes of producing from flax, hemp or similar fibrous substances, dressed or undressed, wove yarn, suitable for making ropes or cordage."

Remarks by the Editor.—We confess that we have been much disappointed in the anticipations which we had entertained when we were about to examine this specification. We could not have conceived it possible that the space which it occupies, and the drawings which accompany it could have been devoted to improvements so simple in their character, and so easily described. As respects the three things claimed, two of them, at least, may be dispensed with. Thus, for example, instead of making the rollers adjustable, as described, separate machines, differently proportioned, would produce the same result, although, certainly, at a greater expense. It may admit of a doubt, however, whether there is sufficient novelty in this part to sustain the claim, the making of rollers adjustable in similar machinery being a very common practice. The third claim, for increasing the drag on the bobbin, must be confined, as it is, to the particular mode of accomplishing it, as the same end has been heretofore attained by other means; such, for example, as embracing the spindle by a leather collar, the friction of which is regulated by weights, and other modes that will readily suggest themselves. The second claim, to the felt, or cloth, in the conical funnel, alone remains, and this probably, is new, and may be the best mode of attaining the end, and this, in our opinion, is all that can be safely looked to for sustaining the patent, but it is claimed in conjunction with the others.

Should it appear, however, that, from any cause, the machinery now patented produces a better effect, in making *coarser yarn* than has heretofore been produced, we shall readily admit this as a sufficient proof of novelty, and shall heartily wish all success to the proprietors.

Description of an improvement for preventing the waste of heat in Cook Stoves; applicable to other furnaces; for which a patent was granted to ELIPHALET NOTT, *of Schenectady, New York, January 9th,* 1834.

The design of this invention is to prevent the loss of heat in those cook-stoves, which have ovens under and around which flame passes, causing it to produce useful effects by preventing its passing into the room. After specifying particularly the arrangements by which the contemplated end is to be attained, the patentee furnishes the following "SUMMARY"

"The invention and improvement herein contemplated consists in preventing the waste of heat in cook stoves:

"By adjusting the chamber of combustion centrally, and surrounding the same, as far as may be, by the chamber, or chambers, of treatment, in such manner that the heat, in escaping to the room

from the former, must pass through the latter, and be, in passing, either reflected by an interior crust that is a reflector, or arrested by one that is a non-conductor—either in single or double laminae; and if double, with an empty space, or a stratum of non-conducting material between the two—which may be effected by a combination of concentric hollow cylinder or prisms, of the kind, and in the manner aforesaid, or by any other combination preferred—also—

"By combining separate ovens, having an exterior crust of hammered sheet iron, common sheet tin, polished iron, or other metallic reflector, with a central chamber of combustion and flue for flame, either reverberated or not, in such a manner that the former shall be heated by radiation and reflection from the latter, and each, from an integral part of the same instrument:

"Or by combining in a similar manner, a single similar oven, to be heated as aforesaid, with an adjoining chamber of combustion, and flue for flame, whether reverberated or not; from the opposite side of which chamber of combustion and flue, the escape of heat is prevented by a lining of brick, or other non-conducting material—and—

"In preventing the unnecessary diffusion of heat and steam,—

"By suspending over the entire stove, especially in summer, a sheet tin, or other metallic canopy, with an outlet at the apex connecting with the chimney.

The foregoing modes or principles of arrangement are recapitulated, and become the foundation of what is claimed as new.

The intention of the patentee, cannot, we are aware, be fully understood by the foregoing description, or without the drawings, which are deposited in the patent office; these are very well executed, exhibiting the stove in various forms and modes of arrangement, which, however, are not of a character admitting of their being intelligibly described without the drawings themselves. The fireplaces, or *chambers of combustion*, is, as will be seen by examining the foregoing summary, situated in the centre of the stove, and is surrounded by the ovens, or *chambers of treatment*, so that no heat can radiate from the walls of the former without passing through the latter, in the outer wall, or crust of which it is connected by a non-conducting lining. The heat which tends to escape from the lower part of the chamber of combustion, is, in some cases, to be reflected up by polished metal, against the bottom of the oven, by a hollow case, or crust, so placed as to produce that effect. On the top plate there are openings for boilers, made in the usual way, dampers and valves being so placed as to admit and direct the ascending current of heated air, &c. as may be required.

ON THE MANUFACTURE OF VARNISHES.

(Continued from p. 60.)

Directions for making Varnish on the small scale, with the fewest utensils.

First procure a gum pot, No. 3, or smaller if required; then a three-footed iron trevet with a circular top, the feet sixteen inches in

length, and made to stand wider at the bottom than top, which is to be made so as the pot will fit easily into it. Place the trevet in a hollow in a field, yard, garden, or out house, where there can be no danger from fire; raise a temporary fireplace round the trevet with loose bricks, after the same manner that plumbers make their furnaces; then make up a good fire with either coke, coal, or wood charcoal, which is far preferable; let the fire burn to a good strong heat; set on the gum pot with three pounds gum copal: observe, that if the fire surround the gum pot any higher inside than the gum, it is in great danger of taking fire. As soon as the gum pot begins to fuse and steam, put in the copper stirrer, and keep cutting, dividing, and stirring the gum to assist its fusion; and if it feels lumpy and not fluid, and rises to the middle of the pot, lift it from the fire, and set it on the ash bed, and keep stirring until it goes down (meantime let the fire be kept briskly up;) then set on the gum pot again, and keep stirring until the gum appears fluid like oil, which is to be known by lifting up the stirrer so far as to see the blade. Observe, that if the gum does not appear quite fluid as oil, carry it out whenever it rises to the middle of the pot, and stir it down again, (keep up a brisk fire,) put on the pot, and keep stirring until the gum rises above the blade of the stirrer, call out to the assistant "be ready:" he is then, with both hands, to lay hold of the copper pouring jack, charged with clarified oil from No. 2, and lean the spout about one inch and a half over the edge of the gum pot; let him keep himself firm, steady, and collected, and not flinch, spill, or pour the oil, which would perhaps set all on fire. Observe when the gum rises within five inches of the pot mouth, call out "pour;" the assistant is then to pour in the oil very slowly until towards the last, the maker stirring during the pouring.

If the fire at this time is strong and regular, in about eight or ten minutes the gum and oil will concentrate and become quite clear: this is to be tested by taking a piece of broken window glass in the left hand, and with the right lifting up the stirrer and dropping a portion of varnish on it; if it appears clear and transparent, the oil and gum are become concentrated or joined together. It is now to be further boiled until it will string between the finger and thumb: this is known by once every minute dropping a portion on the glass, and taking a little between the fore finger and thumb; pinch it first, then extend wide the finger and thumb: if it is boiled enough, it will stick strong and string out into fine filaments like bird lime; but when not boiled enough, it is soft, thick, and greasy, without being stringy. The moment it is boiled enough, carry it from the fire to the ash-bed, where let it remain from fifteen to twenty minutes, or until it is cold enough to be mixed; have at hand a sufficient quantity of oil of turpentine to fill the pouring pot, begin and pour out with a small stream, gradually increasing it, and if the varnish rises rapidly in the pot, keep stirring it constantly at the surface with the stirrer to break the bubbles, taking care not to let the stirrer touch the botton of the pot, for if it should, the oil of turpentine would be in part converted into vapour, and the varnish would run over the pot in a moment; therefore, during the mixing, keep constantly stirring as well as pouring in at the same time. Have also a copper ladle at hand, and if it

should so far rise as to be unmanageable, let the assistant take the ladle and cool it down with it, lifting up one ladleful after another, and letting it fall into the pot. As soon as the varnish is mixed, put the varnish sieve No. 1 in the copper funnel placed in the carrying tin, and strain the varnish immediately; empty it into open mouthed jars, tins, or cisterns; there let it remain to settle, and the longer it remains the better it will become. Recollect, when it is taken out, not to disturb or raise up the bottoms.

General Observations and Precautions to be observed in making Varnish.

Previous to beginning to make varnish, take care that the making house is completely cleared of every unnecessary article. Have every necessary article perfectly clean and in good order. If the weather is fine, at a convenient distance outside sift some dry ashes through a fine sieve to form an ash bed; make it a little larger than the bottom of the boiling pot, one inch and a half deep, and smooth and level on the surface, on which set the boiling pot every time it is necessary to bring it out.

About four feet from the ash bed erect a circle of loose bricks four courses high; lay them so that when the gum pot is set within it will rest securely by its flanch, with the bottom about six inches from the ground. Upon this brick stand set the pot each time there is occasion to carry it out, and stir it down; four feet from the stand set the iron trevet for turning up the gum pot each time after it is washed out, as by so doing it will always be kept clean, and cool gradually; for, by cooling very rapidly, copper oxidises very quickly. Near the trevet set the large wide tin jack, ready to receive the washings; also the swish broom each time the pot is washed out. Have also at hand one copper ladle, and a tin bottle with three gallons of oil of turpentine for washing with when wanted. Supposing every thing so far ready, if both the boiling pot and gum pot are to be used at the same time, let the assistant lay the fire ready, set on the boiling pot with eight gallons of oil, kindle the fire; then lay the fire in the gum furnace, have as many eight pound bags of gum, all ready weighed up, as will be wanted; put one eight pound into the pot; put fire to the furnace, set on the gum pot, in three minutes (if the fire is brisk) the gum will begin to fuse and give out its gas, steam, and acid; stir and divide the gum, and attend to the rising of it, as before directed: eight lbs. of copal takes, in general, from sixteen to twenty minutes in fusing, from the beginning, till it gets clear like oil; but the time depends very much on the heat of the fire and the attention of the operator. During the first twelve minutes, while the gum is fusing, the assistant must look to the oil, and bring it to a smart simmer, for it ought to be neither too hot, nor yet too cold, but in appearance beginning to boil, which he is strictly to observe, and, when ready, call out 'bear a hand,' then immediately each lay hold of one handle of the boiling pot, lift it right up so as to clear the plate, carry it out and place it on the ash bed, the maker instantly returning to the gum pot, while the assistant puts three copper ladlefuls of oil into the copper pouring

jack, bringing it in and placing it on the iron plate at the back of the gum pot to keep hot until wanted. When the maker finds the gum is nearly all completely fused, and that it will in a few minutes be ready for the oil, let him call out, "ready oil;" the assistant is then to lift up the oil-jack with both hands, one under the bottom, and the other on the handle, laying the spout over the edge of the pot, and wait until the maker calls out "oil;" the assistant is then to pour in the oil as before directed, and the boiling be continued until the oil and gum become concentrated, and the mixture looks clear on the glass; the gum pot is then to be set upon the brick stand until the assistant puts three more ladlefuls of hot oil into the pouring jack, and three more into a square tin for the third run of gum. There will remain in the boiling pot still three and a half gallons of oil. Let the maker put his right hand down the handle of the gum pot near to the side, with his left hand near the end of the handle, and with a firm grip lift the gum pot, and deliberately lay the edge of the gum pot over the edge of the boiling pot, and gently raise up the bottom of the gum pot until all its contents run into the boiling pot. Let the gum pot be held, with its bottom turned upwards, for a minute, right over the boiling pot. Observe, that whenever the maker is beginning to pour, the assistant stands ready with a thick piece of old carpet, without holes, and sufficiently large to cover the mouth of the boiling pot should it catch fire during the pouring, which will sometimes happen if the gum pot is very hot; should the gum pot fire, it has only to be kept bottom upwards, and it will go out of itself; but if the boiling pot should catch fire during the pouring, let the assistant throw the piece of carpet quickly over the blazing pot, holding it down all round the edges; in a few minutes it will be smothered. The moment the maker has emptied the gum pot, throw into it half a gallon of turpentine, and with the *swish* immediately wash it from top to bottom, and instantly empty it into the flat tin jack; wipe the pot dry, and put in eight lbs. more gum, and set it upon the furnace; proceed with this run exactly as with the last, and afterwards with the last or third run. There will then be eight gallons of oil, and twenty-four pounds of gum in the boiling pot, under which keep up a brisk, strong fire until a scum or froth rises and covers all the surface of the contents, when it will begin to rise rapidly. Observe, when it rises near the rivets of the handles, carry it from the fire, and set it on the ash bed, stir it down again, and scatter in the driers by a little at a time; keep stirring, and if the frothy head goes down, put it upon the furnace, and introduce *gradually* the remainder of the driers—always carrying out the pot when the froth rises near the rivets. In general, if the fire be good, all the time a pot requires to boil, from the time of the last gum being poured in, is about three and a half, or four, hours; but *time* is no criterion for a beginner to judge by, as it may vary according to the weather, the quality of the oil, the quality of the gum, the driers, or the heat of the fire, &c.; therefore, about the third hour of boiling, try it on a bit of glass, and keep boiling it until it feels strong and stringy between the fingers—it is then boiled sufficiently; carry it on the ash-bed, and stir it down until it is cold enough to mix, which will de-

pend much on the weather, varying from half an hour in dry frosty weather to one hour in warm summer weather. Previous to beginning to mix, have a sufficient quantity of turpentine ready, fill the pot and pour in, stirring all the time at the top, or surface, as before directed, until there are fifteen gallons, or five tins, of oil of turpentine introduced, which will leave it quite thick enough, if the gum is good and has been well run; but if the gum was of a weak quality, and has not been well fused, there ought to be no more than twelve gallons of turpentine mixed, and even that may be too much. Therefore, when twelve gallons of turpentine have been introduced, have a flat saucer at hand, and pour into it a portion of the varnish, and in two or three minutes it will show whether it is too thick; if not sufficiently thin, add a little more turpentine, and strain it off quickly. As soon as the whole is stored away, pour the turpentine washings with which the gum pots have been washed into the boiling pot, and with the swish quickly wash down all the varnish from the pot sides; afterwards, with a large piece of woollen rag dipped in pumice powder, wash and polish every part of the inside of the boiling pot, performing the same operation on the ladle and stirrers; rince them with the turpentine washings, and at last rince them altogether in clean turpentine, which also put to the washings: wipe dry, with a clean soft rag, the pot, ladle, stirrer, and funnels, and lay the sieve so as to be completely covered with turpentine, which will always keep it from gumming up. The foregoing directions concerning running the gum and pouring in the oil, and also boiling off and mixing, are, with very little difference, to be observed in the making of all sorts of copal varnishes, except the differences of the quantities of oil, gum, &c. which will be found under the various descriptions by name, which will be hereafter described.

On Gums Copal.

Gums copal are of three different sorts and qualities: the best is brought from Sierra Leone, in Africa, and, when imported, is about the size of small potatoes, and is covered all over with a rough coat of dust, or clay-like substance. It is most commonly bought in that state by varnish makers, gum dealers, and druggists, who scrape it; that is, they generally have women who scrape it, bit by bit, with sharp penknives or razors: it is rather pared than cut quite free from dust; it is afterwards picked by hand into three different qualities. All the finest and palest is put by itself; this call body gum: pick out the next best, and placing it by itself, call it carriage gum. From the remainder pick out all pieces of wood, stones, &c.; this is the third or worst quality, and serves for gold size or japan black.

The second sort of gum copal, imported from South America, is, in appearance, somewhat like the African, but much larger, and to those who are not good judges, appears far the best, although in reality not worth one-third the value of African, as, after all the labour of scraping, picking, &c., it is, in general, so full of acid and sap, that not above two-thirds of it is fusible, and perhaps, in many instances, not

more than one-third, and some whole casks are imported not worth one farthing; however, by proper judgment and long experience, there may at times be found some passable samples, which may answer for very cheap varnishes.

The third sort of gum copal is never imported by itself, but is found mixed among the gum anime. It is very large, pale, hard, and transparent, and fuses well and fixes well, and makes excellent varnish.

Gum Anime.

All gum anime is imported from the East Indies, and is sold at the Company's sales in lots of two chests, each weighing from three to five cwt., the sizes varying very much, as well as the quality. The chests which contain the palest and largest gum always sell for the highest price, particularly those chests which are imported ready scraped, as there are great quantities imported which come over unscraped, and is termed pickled; that is, clean from its rust by laying for several days in a very strong alkali, well washed with a broom, and afterwards washed with water. This sort is not so good as that which is scraped with the knife, and it in general sells for one-third less than that which is scraped. But in picking and sorting anime, observe and pick out all the fine, large, and transparent pieces first; these call body gum: then pick and sort the remainder as directed for the copal, making three sorts. Recollect, all sorts of gums can be procured, ready picked and sorted, from the gum merchants and dealers.

Amber.

There are two sorts of amber, each of various qualities: the best is imported from Prussia and Poland. It is found in mines and in rivers. It is very thin, solid, pale, hard, and transparent. It is the sort from which beads are made, and many other curiosities, and forms the most solid, hard, and durable varnish that can be made, either by employing it by itself, or as a component part with gum, &c. The other sort of amber is called sea amber: it comes from many places abroad. It is much darker than the first amber, and about the size of coffee beans; is harder to fuse, has less fluidity, affords most salt, gas, and acid during its fusion, and leaves a considerable quantity of impure earthy matter at the bottom of the pot on fusion, whereas the best sort will completely dissolve like oil.

Gum Sandarach

Is so well known that no description is necessary. Procure the largest and cleanest, which will always be found the cheapest in the end.

Gum Mastic

Is likewise well known, can be procured at almost every druggist's shop, and when very fine mastic varnish is required for valuable paintings, the mastic is put upon a tea-tray, or mahogany table, and every fine and clean piece picked out, until all the inferior, small, yellow,

and dirty, are left. Take a sufficient quantity of the fine picked mastic, and reserve it for making picture varnish; the inferior reserve for common mastic varnish.

Gum Cat's-eye

Is a large, pale, transparent gum, but little known; it is quite resinous and pulverulent between the teeth; is like gum sandarach. It is very pale, will dissolve in hot turpentine, is very little better than pale rosin, and is chiefly used in making a varnish for paper hangings, and adulterates common cheap mastic varnish.

These are the principal gums required in the making of varnish; any others required being in such very small quantities that their description is unnecessary.

After having procured the necessary gums, and sorted them as before directed, procure a board about the size of a large tea tray, and fix on to it a back and two ends, leaving it open at front; procure also a piece of lead, eight inches long by six inches broad, and two inches thick; place the lead on the wooden tray, fill one end of the tray with the assorted gum, which requires breaking; procure, likewise, a small hammer with the end reversing, the proper face of the hammer steeled and ground quite sharp; sit down, and with the left hand drag to one side every piece of gum that does not require to be broke, but every piece above the size of a filbert lay on the piece of lead, and holding the gum flat and steady between the fore finger and thumb of the left hand, with the hammer in the right hand, hit the piece of gum one steady stroke, and cut it by piece after piece, into the size of common filberts; the gum is then ready for the gum pot. Recollect, during the process of breaking gum, to cut out every black, dirty, or watery piece as it comes to hand, and lay them aside, to be used with similar sorts.

[TO BE CONTINUED.]

Selection of earthy Matter by the roots of Plants.

In the Philosophical Magazine for January is an abstract of a paper by Dr. Daubeny, Professor of Chemistry in the University of Oxford, which was read before the Linnæan Society on the 19th of November and 3d of December last, entitled, "On the Degree of Selection exercised by Plants with regard to the Earthy Constituents presented to their Absorbing Surfaces." This paper, which is altogether experimental, bears directly on the theory of the absorption of nutriment in general by plants.

The author states that he was first led into this train of experiment with the hope of ascertaining, by more decisive experiments than had been hitherto done, whether plants are able, under any circumstances, to form those earthy and alkaline matters which they usually contain, when not supplied with them from without.

With this view, he planted a known weight of the seeds of certain vegetables in earths of known composition, introduced, in a finely divided state, into boxes cased internally with sheet zinc. One box,

containing each kind of earth, was placed in a garden exposed to rain and dust, and a corresponding one of each kind in a green-house protected from both. The earths employed were, washed sea sand, Carrara marble, and sulphate of strontian.

The crop obtained from each of the boxes was separately burnt, and the ashes weighed and examined chemically. That from the boxes placed in the garden was greater than that from those in the green-house; but in both cases an increase of earthy matter was observed beyond that which existed in the seeds from which they had sprung.

Having remarked, however, that the plants grown in strontian contained none of that earth, he resolved to try whether this circumstance might be owing merely to the insolubility of the sulphate in water, or to some specific power, belonging to the plant, of rejecting the earth in question.

He therefore varied the experiment the succeeding year, by planting the seeds in four different soils, namely, sand, marble, sulphate of strontian, and flowers of sulphur, and watering them with a weak solution of nitrate strontian. In every instance there was an increase of calcareous matter, beyond that present in the seeds; greatest in the plants that had grown in sulphate of strontian and in Carrara marble, least in those planted in sulphur; but the largest quantity of strontian ever detected by chemical means from their ashes did not exceed 0.4 of a grain. From these and similar experiments detailed in the memoir, the author concludes that the absorbing surfaces or spongioles of the roots of plants either do not admit of strontian earth at all, even in a state of solution, or at least receive it much less readily than they do calcareous matter.

He details an experiment to show that the absence of strontian from the solid parts of the plants was owing to its remaining unabsorbed by the roots, not to its being excreted by them, and accounts for the difference between what happened in the instance of the strontian, and that which he had himself observed in common with M. de Saussure, as holding good with regard to solutions of substances more directly injurious to the plant, by supposing, in the latter instance, the spongioles to be disorganized by the poisonous quality of the substance, and consequently to have allowed the solution to be absorbed by capillary attraction. In this latter case he observed, that before the plant is destroyed, a portion of the poisonous substance will be excreted again by the spongioles of the roots.

Upon the whole he concludes, that his experiments lend no countenance to the idea that plants can form earthy constituents when not supplied to them from without, although they do not altogether demonstrate the reverse. They seem, however, to show more decisively that plants do, to a certain extent at least, possess a power of selection, and that the earthy constituents which form the basis of their solid parts are determined as to *quality* [*kind?*] by some primary law of nature, although their *amount* may depend upon the more or less abundant supply of the principles presented to them from without. [*Rep. Pat. Inv.*

Incorporated Rail-road Companies in the State of New York.

NAMES.	To construct a Rail-road, From	To	When incorporated.	Capital.
Albion and Tonawanda	Albion	Batavia	1832	$250,000
Auburn and Canal	Auburn	Erie Canal	1832	150,000
Aurora and Buffalo	Aurora	Buffalo	1832	300,000
Brooklyn and Jamaica	Brooklyn	Jamaica	1832	300,000
Buffalo and Erie	Buffalo	Erie, Penn.	1832	650,000
Black River Company	Rome	Ogdensburg	1832	900,000
Buffalo and Black Rock	Buffalo	Black Rock	1833	100,000
Binghamton and Susquehanna	Binghamton	Penn. Line	1833	150,000
Catskill and Canajoharie	Catskill	Canajoharie	1830	600,000
Dansville and Rochester	Dansville	Rochester	1832	300,000
Dutchess	Poughkeepsie	Connecticut	1832	600,000
Elmira and Williamsport	Elmira	Pennsylvania	1832	75,000
Fish House and Amsterdam	Fish House	Amsterdam	1832	250,000
Great Au Sable	Keesville	Port Kent	1833	60,000
Harlaem	Prince-st. N. Y.	Harlaem	1831	350,000
Hudson and Berkshire	Hudson	Mass. St. Line	1832	350,000
Hudson and Delaware	Newburgh	Delaware River	1830	500,000
Ithaca and Geneva	Ithaca	Geneva	1832	800,000
Ithaca and Owego	Ithaca	Owego	1828	300,000
Lake Champlain and Ogdensburgh	Lake Champlain	Ogdensburgh	1832	3,000,000
Mayville and Portland	Portland	Mayville	1832	150,000
Mohawk and Hudson	Schenectady	Albany	1826	600,000
New York and Albany	New York	Albany	1832	3,000,000
New York and Erie	New York	Lake Erie	1832	10,000,000
Otsego	Cooperstown	Colliersville	1832	200,000
Rensselaer and Saratoga	Troy	Ballston Spa.	1832	300,000
Rochester	Rochester	Genesee Port.	18 1	30,000
Saratoga and Fort Edward	SaratogaSprings	Fort Edward	1832	200,000
Saratoga and Schenectady	Saratoga	Schenectady	1831	150,000
Saratoga Springs and Schuylerville	SaratogaSprings	Schuylerville	1832	100,000
Schoharie and Otsego	Schoharie Co.	Susque. river	1832	300,000
Tonawanda	Rochester	Attica	1832	500,000
Utica and Susquehanna	Utica	Susque. River	1832	1,000,000
Utica and Schenectady	Utica	Schenectady	1833	2,000,000
Warren County	Glenn's Falls	Warrensburg	1832	250,000
Watertown and Rome	Rome	Watertown	1832	1,000,000
Whitehall and Rutland	Whitehall	Rutland, Vt.	1833	150,000
				$29,865,000

Damascus Steel.

The steel of which the beautiful sword blades of Damascus are manufactured, has hitherto baffled all attempts at imitation. It is ge-

nerally supposed to be made of slips or thin rods or wires of iron and steel, bound together by iron wire, and then melted together by heat. The most skilful workmen of other countries have attempted to imitate this process, but in vain: so that there is reason to think that the secret of the manufacture has not yet transpired. The colour of the Damascus blades is a dull bluish gray, and scarcely exceeds in hardness common steel from the forge. It is difficult to bend; and when bent does not resume its shape; the principal character, however, is its *water*, or a peculiar wavy appearance running from the hilt to the point in narrow lines, the thickness of a harpsicord wire, which never cross each other. These waving lines arise from a slight difference in the degree of polish occasioned by the unequal action of acid upon the steel; any weak acid would produce this effect, but at Damascus sulphate of alumine is the substance used. This appearance of waving lines has been imitated by a false damasking, or etching, but the genuine Damascus blade is distinguished from the false one by the obliteration of the lines in grinding, which takes place in the latter. In the real Damascus blades, grinding nearly removes the water, but it immediately reappears by rubbing the blades with lemon juice.

CELESTIAL PHENOMENA, FOR SEPTEMBER, 1834.

Calculated by S. C. Walker.

Day.	H'r.	Min.				
6	8	54	Im. 79 Virginis	,7,	N127°	V178°
6	9	24	Em.		191°	240°
8	8	42	Im. β' Scorpii	,2,	191°	237°
8	9	46	Em.		193°	228°
11	10	22	N. App. ☽ and 261 Sagittarii	,6, 7,	☽ South	8′.3
14	7	58	Im. κ Capricorni	,5,	156°	164°
14	9	3	Em.		250°	264°
17	7	7	N. App. ☽ and 249 Piscium	,7,	☽ South	4′.1
17	7	16	Im. τ Piscium	,5, 6,	135°	184°
17	8	23	Em.		281°	340°
17	10	3	Im. s Piscium	,5,	102°	72°
17	11	24	Em.		326°	302°
19	17	39	Im. ν Piscium	,5,	66°	114°
19	18	24	Em.		350°	40°
20	6	57	N. App. ☽ and 64 Ceti	,6, 7,	South	0′.5
23	17	37	Im. ♃'s centre		152°	189°
23	18	38	Em.		234°	285°
20	7	29	Im. ξ' Ceti	,5,	120°	69°
20	8	38	Em.		288°	237°
24	12	35	Im. 121 Tauri	,6,	42°	345°
24	13	7	Em.		345°	284°

Sympathetic Ink.

The following affords a sympathetic ink very far superior to any, as yet, in use. Dissolve a small quantity of starch in a saucer with soft water, and use the liquid like common ink: when dry, no trace of the writing will appear upon the paper, and the letters can be developed only by a weak solution of iodine in alcohol, when they will appear of a purple colour, which will not be effaced until after long exposure to the atmosphere. So permanent are the traces left by the starch, that they cannot, when dry, be affected by Indian rubber, and in another case a letter which had been carried in the pocket for a fortnight, had the secret characters displayed at once, by being very slightly moistened with the above-mentioned preparation.

Meteorological Observations.

Meteorological Observations for June, 1834.*

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.			Inches.	
	1	56°	64°	29.80	29.70	SE.	Moderate.	0.53	Rain—drizzle.
	2	64	75	.50	.50	SW. W.	Stormy.		Cloudy—clear.
	3	47	68	.65	.65	W.	do.		Clear day.
	4	47	77	.70	.65	SW.	Moderate.	1.10	Clear; cldy; rain in nt.; thunder
☽	5	52	53	.35	.35	W.	do.	0.20	Rain—drizzle. [and lightning
	6	57	76	.65	.75	N. E.	do.		Clear day.
	7	56	83	.75	.75	NW.	do.		Clear day.
	8	57	86	.75	.80	W.	Calm.		Clear—aurora borealis.
	9	67	94	.80	.80	S. SSW.	Breeze.		do.
	10	64	92	.80	.80	SW. W.	do.	0.50	Clear—storm in the evening.
	11	70	71	.64	.80	SW. W.	do.		Cloudy; clear, bright in the north.
	12	52	74	.85	.90	W.	do.		Clear—aurora borealis.
	13	56	80	.85	.75	SW.	do.		Cloudy—lightly cloudy.
	14	53	74	.80	.85	W.	do.		Clear—flying clouds.
☾	15	54	70	.70	.90	SSE.	do.	0.15	Clear—fly. clouds—rain in night.
	16	50	70	.80	.80	SE. W.	do.		Cloudy day.
	17	56	64	.80	.70	SE.	do.	0.24	Cloudy—rain in the night.
	18	62	74	.54	.35	SE. SW.	Stormy.		Cloudy—flying clouds.
	19	65	78	.55	.53	W.	do.		Clear day.
	20	58	78	.65	.65	W.	Breeze.	0.10	Clear day.
	21	54	81	.70	.70	W.	do.	0.18	Clear—fly. clouds—rain in night.
	22	62	80	.70	.75	SE.	do.	0.06	Cloudy—clear—rain in night.
☉	23	68	85	.70	.75	SW.	do.	0.09	Cloudy—clear—shower.
	24	69	89	.70	.70	SW.	do.		Clear day.
	25	63	78	.70	30.05	SW.	do.		Fog—flying clouds.
	26	69	85	.55	29.90	W.	do.		Clear day.
	27	62	83	30.00	30.00	SW.	do.		Shower—cloudy.
	28	59	80	.00	29.95	W.	do.	0.19	Drizzle—Fly. cl'ds—rain in night.
☽	29	62	74	29.74	.74	SE.	do.	0.10	Clear day.
	30	63	77	.74	.85	NE. W. W.	do.		
	Mean	59.77	76.73	29.73	29.75			3.53	

Thermometer.			Barometer.
Maximum height during the month,		94. on 9th.	30.05 on 25th.
Minimum	do.	47. on 3d & 4th.	29.35 on 5th, & 18th.
Mean	do.	68.25	29.74

* Errata.—The Meteorological Table in the July number was for the month of May, and not for April, as marked.